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THE AUTOMOBILE

Old Dobbin as a Road Destroyer

Horse Is Harder on Highway than Car

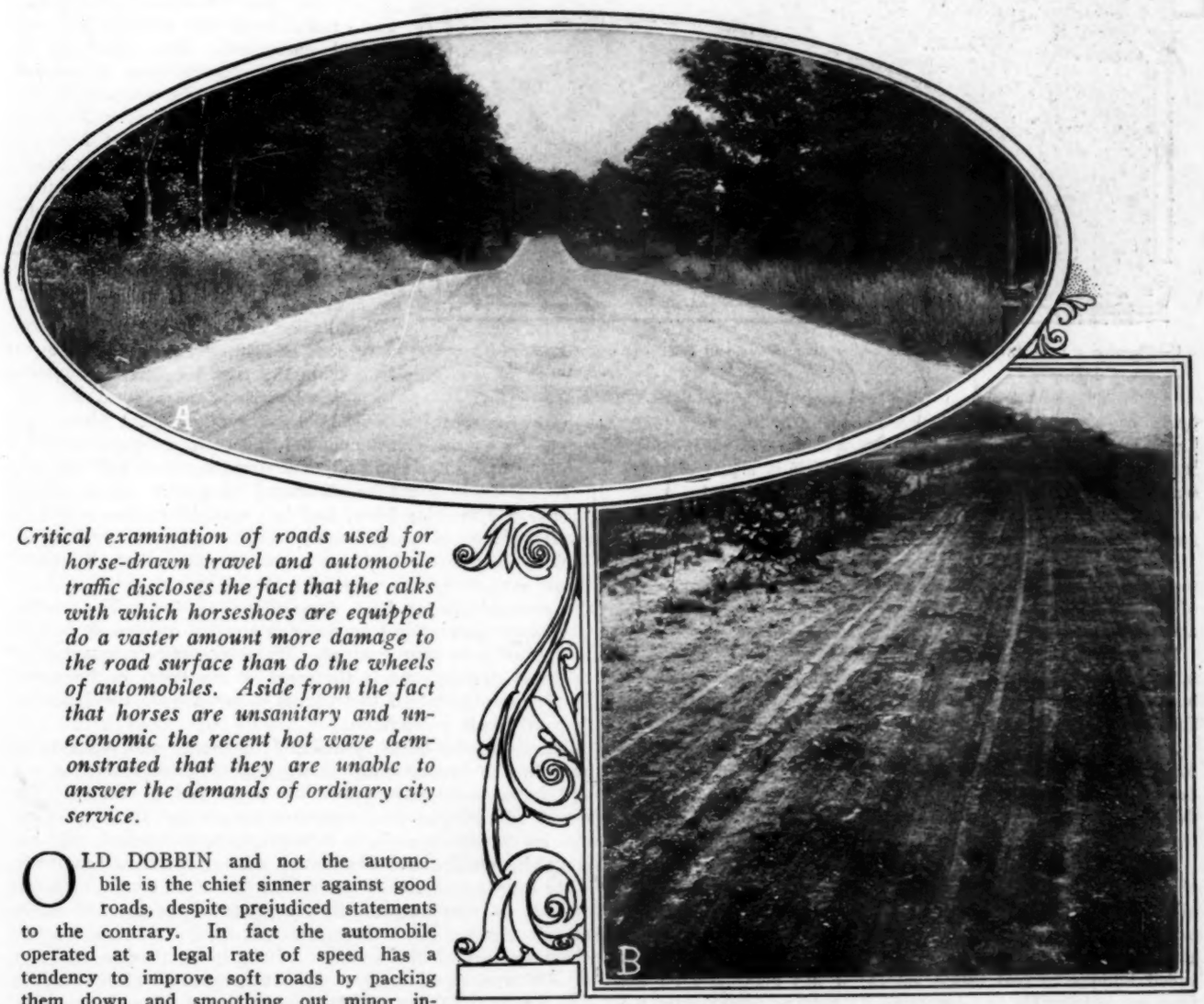


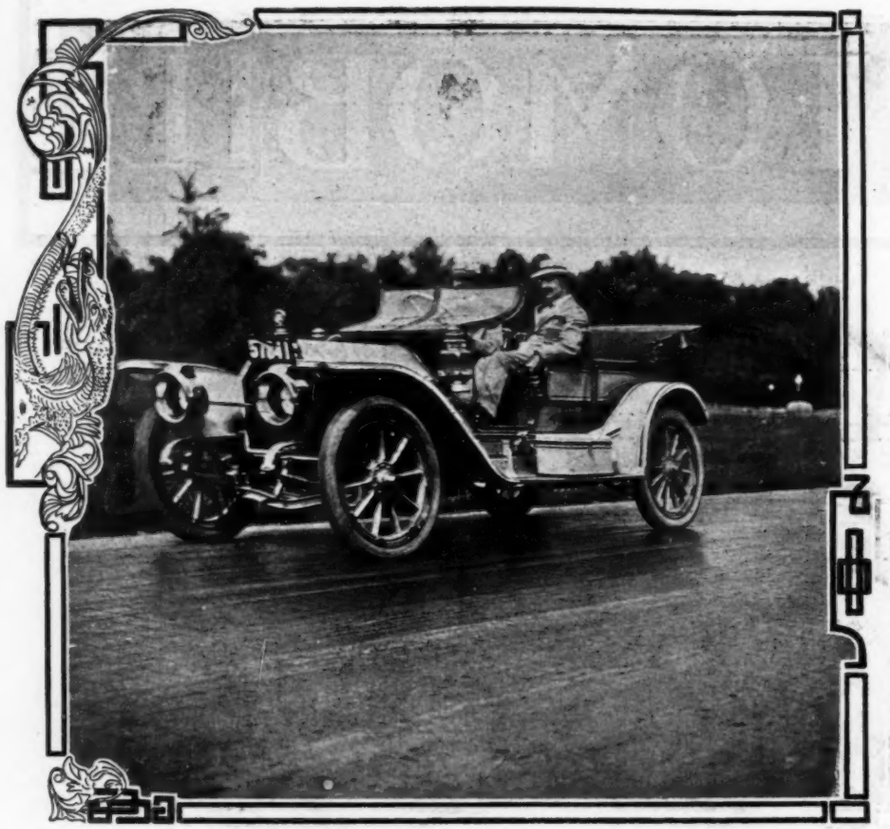
Fig. A.—Showing a dustless stretch of cement block roadway in the Bronx Park
Fig. B.—Efforts are being made to cover up old, worn-out roads with oil and tar, and after a short space of time the surface is similar to this

Critical examination of roads used for horse-drawn travel and automobile traffic discloses the fact that the calks with which horseshoes are equipped do a vaster amount more damage to the road surface than do the wheels of automobiles. Aside from the fact that horses are unsanitary and uneconomic the recent hot wave demonstrated that they are unable to answer the demands of ordinary city service.

OLD DOBBIN and not the automobile is the chief sinner against good roads, despite prejudiced statements to the contrary. In fact the automobile operated at a legal rate of speed has a tendency to improve soft roads by packing them down and smoothing out minor inequalities, while Dobbin's sharp iron calks tear up the surface and necessitate repairs.

On the ordinary country road, no matter how well-oiled it may be, the chopping action of horses' calks will soon reduce it to its primitive condition, while the passage of motor traffic will benefit it under moderate conditions. It stands to reason that the wide, smooth tires of an automobile will act as a sort of power-roller and the picking of the horseshoes will tend to destroy the surface.

Where the roads are macadamized, paved with bitulithic, block or any other surfacing than stone blocks, the action of horses' hoofs is destructive while the rolling of automobiles is not. Where a horse, trotting along at the rate of ten miles an hour has calks on his shoes say 5-8 of an inch long, he picks up soft road surface with every stride and does more



C—Showing a powerful touring car traveling over the cement brick surface at a fair speed without the slightest sign of dust

harm to a straight country road than a racing automobile. Upon an improved road, the damage he does is almost calamitous. His shoes pierce the surface, which is supposed to be waterproof, and break it down so that water can soak through to the foundation. Then when it freezes the water under the surface expands and completes the work of destruction.

The force of freezing water is so powerful that it will burst metal and where it finds a resting place against a heavy body of concrete, for instance, its bursting power is exerted upward and results in a surface humped up and disintegrated in spots.

During periods of warm weather in winter the passage of a horse or an automobile discovers faults in a fine new pavement built the preceding autumn, and in certain districts these faults are laid unreservedly at the door of the automobile.

As this country will spend something over $1,000,000 a day for road construction during the next year and as the most destructive agent in nullifying this work and making valueless this vast expenditure is the horse, it is important to place the responsibility where it belongs.

Automobiles have come to stay. They represent a condition of progress in the essential of quick transportation. The volume of automobile traffic is going to increase with every year, because the condition of civilization insists that it shall. The automobile is the advance guard of transportation. It has added billions to real estate values; it has made life on the farm more tolerable and increased its holding power upon the young people. It has made for health, pleasure and recreation and now is striding forward as one of the most important factors in business life of whatever character.

It is not going back because it represents progress, and the wheels of advancement as symbolized in the automobile are rolling inexorably forward. The history of the world holds no instance of retrogression in the art of transportation, and it is not reasonable to suppose that any precedent will be set with regard to such a proven blessing as the automobile.

To illustrate the difference between the action of the horse and the car, take for instance a man with a roller and one equipped with a pick. Let each set out to damage a road as much as possible, the one with the roller, using it as vigorously as his muscles will let him and the one with the pick making three holes a minute. At the end of a day covering eight hours of labor, the man with the pick will have destroyed a stretch of roadway ten feet wide and about 200 feet long, while the fellow with the roller will have improved his road materially wherever he worked.

The most usual argument in favor of the horse is that he is indispensable and that as a consequence, his damage to roads, menace to public health, general uneconomic status and his obstruction to progress must be suffered.

It is true that the common fly depends in large measure upon the horse for the means and medium of incubation and it is equally true that the fly is a distinct menace to health entirely aside from being an unmitigated nuisance. The fly carries germs of disease that are transmissible to human beings and even without the addition of filthy germs, his presence in a bedroom, workroom or dining room is as incongruous and disagreeable as is the presence in the crowded subway car of a man who has eaten onions and limburger for breakfast washed down with alcoholic potations.

The fly causes a vast amount of nervous prostration by his presence in the home and fills sickrooms, hospitals and graves.

If the horse could be eliminated altogether the fly would receive a staggering blow, and his total destruction would be rendered only a comparatively simple matter. Another unsanitary feature of the horse is the fact that where he cannot injure such pavements as granite blocks, he can and does cause the groundwork for fetid, disease-breeding dust. The average city block where horse traffic is general is covered daily with a layer of poisonous material. This necessitates constant labor of street cleaners, and in the event of any laxity on their part in the performance of their duties, a hot sun on the following day will create a condition.

Then, too, the horse is wasteful of energy and is inefficient according to modern ideas. Years ago when transportation was still in its swaddling clothes the horse had a mission. For dozens of centuries he represented the idea of speed. But today his mission, especially in large cities, is finished. He has served his purpose and whether we will or not, he must step back.

He cannot compete as the motive power of trucks or hacks or even delivery wagons with the power of the gasoline or the electric motor. He is too slow and costly. If any concrete demonstration of the unfitness of the horse to cope with the terrible stresses of modern life was needed to show that his day is past, the recent terriffic heat in New York and practically every large city in the eastern half of the country expressed the condition with exceeding clearness.

It has been learned that during the two weeks through which the country suffered such tortures from the heat recently, seventeen per cent. of all the horses engaged in trucking and delivery work died. That means that one out of every six horses so engaged on July 1, 1911, was dead by July 12.

Every city government in the United States east of the Rocky Mountains was so prostrated by the item of dead horses

in the streets that it had to slight other municipal work to pick up the rotting remains. In New York City horses lay dead in some of the outlying districts for a day or more in the blistering heat.

There was an ice famine to make matters worse and to no small degree the suffering of the city may be properly laid to the inefficiency of the horse. Dobbin could not deliver the usual load of ice at all. He could not begin to give satisfactory service and the sight of the suffering horses panting and straining under the fearful heat was a picture to bring tears to the eyes of any person with human feelings. Patiently the poor animals strove to obey the orders of their masters, but they failed and many a ton of ice melted and ran away during that siege of heat owing to the impossible task of drawing it along the fiery pavements.

A comparatively few motor trucks would have saved much suffering to the populace by more complete and vastly more certain and swift deliveries between ice docks and distributing warehouses. The people could have had hundreds of tons of ice that melted on the streets and the horse could have been saved much unnecessary suffering and much useless slaughter.

Electricity and steam have displaced the horse as motive power in railway work and that fearful blast of heat this month has gone a long way toward completing the emancipation of the horse from heavy trucking and delivery work in the big cities and placing his duties upon the gasoline and electric motors.

D—The same car traveling at the same rate of speed as shown in C over a macadamized road. Notice the dust raised

The hog has been barred from municipal life in well-ordered communities and so has the cow. The dog and cat have no reason for existence in crowded cities and both are being legislated out into the country or the crematory. The horse alone is allowed to remain side by side with man on account of his alleged usefulness still being sufficient to mankind to countenance his smells, flies, expense and general lack of sanitation.

The progress in transportation along scientific lines, which has presented to humanity the automobile in its present stage, has also presented the solution to the horse problem. And if any additional force was necessary to make the lesson sink deep into the understanding of thinking men, the hot wave certainly had the force to emphasize the situation.

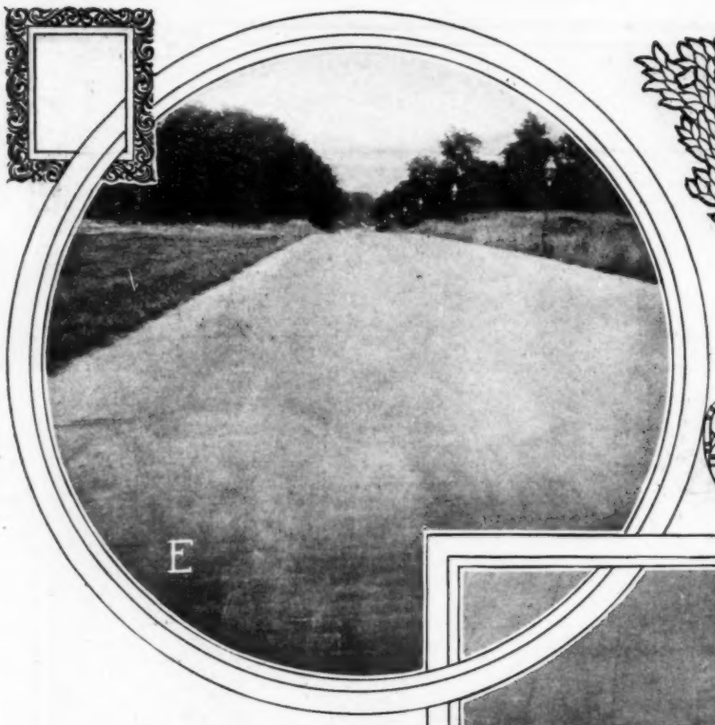
The indictment against the horse is complete in many counts. He is destructive of the roads to a greater gross amount annually in the United States than the sum of the Rivers and Harbors and the Diplomatic appropriations of the United States Government. If half the flies are accountable to horses and if all the flies shorten human life by the span of two years, as the scientists say, the horse is chargeable with shortening the lives of 100,000,000 people, citizens of the United States, by one year each. If the average life is 33 or 34 years in length, it means that 3 per cent. of man's usefulness is paid for the privilege of having horses and flies as incidents of his life.

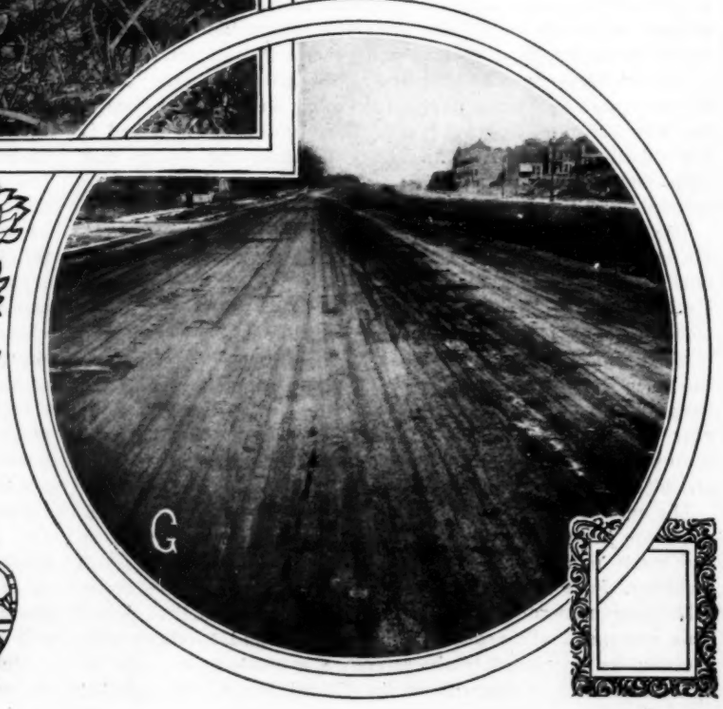
The automobile is faster, surer, more enduring, more economical, more healthful, actually cheaper in operation and first cost and vastly more satisfactory than the horse. In the matter of accidents, those in which horse-drawn vehicles figure are manifold more numerous than those in which automobiles figure. This statement will probably be challenged and to those who question its uncolored truth, reference is made to reports of street casualties of any city in the United States. In crowded sections of New York City the proportion is about ten to one and the proportion of horse-drawn vehicles is nothing like this ratio.

No flies breed in gasoline and lubricating oil drippings and no streets are covered with noisome matter as the result of automobiles standing along the curbs. Suppose that it is admitted for the sake of argument that the horse is better than the automobile in every way but one, it will be found that the single factor is sufficient to counterbalance all the advantage that the supposition gives to the horse. Take them in order of economy, health, speed, certainty, damage to roads and general efficiency and give the horse all but one of the qualities in greater degree than the automobile and the car must triumph. If the horse makes for health, has more speed and certainty and causes less damage to the roads than the car, the automobile would still displace the horse because it is more ecenomical in the cost of operation. If the horse is more economical and all the other things mentioned, except in the matter of health, the growing regard for human comfort and life would still force the supremacy of the car. But when the situation is carefully viewed and each condition weighed with care, it is found that the car possesses all the prime qualities and the horse none of them in comparison with the automobile.

Out in the country where the land lies open to the purifying and life-giving rays of the sun, the horse may still find a moderate field of usefulness. Knee-deep in the odorous blue-grass he may find a mission, albeit but a temporary one. His colts may neigh and toss their manes in the up-land pastures for a few years and the patient mares may browse in the shaded lowlands where the brook smiles and sparkles its way to the great river. But his day in town is ended. His sun has set and, as inexorably as the progress of Juggernaut, he will be forced away from contact with mankind in the cities.

He has been weighed in the balance and found to be lacking in modern efficiency. He has been convicted of breeding dis-





E—General view of the cement block road adjoining the Pelham Parkway, in which the good even surface will be noticed

F—Cement block roadway as seen walking along it, showing the sides made of cement banking with a block interposed between the banking and the edges of the transverse blocks. No provision for expansion is apparent

G—This illustration shows a roadway that has been treated with an oil preparation for laying the dust, and in which the part usually used by horses is badly cut up

ease. He had been demonstrated to lack power and economy compared with other mediums and from the first place in man's affections he has sunk to the point where self-preservation demands that man eliminate him from man's crowded dwelling places, and he is now shown to be destructive of roads and consequently a direct obstacle in the path of progress.

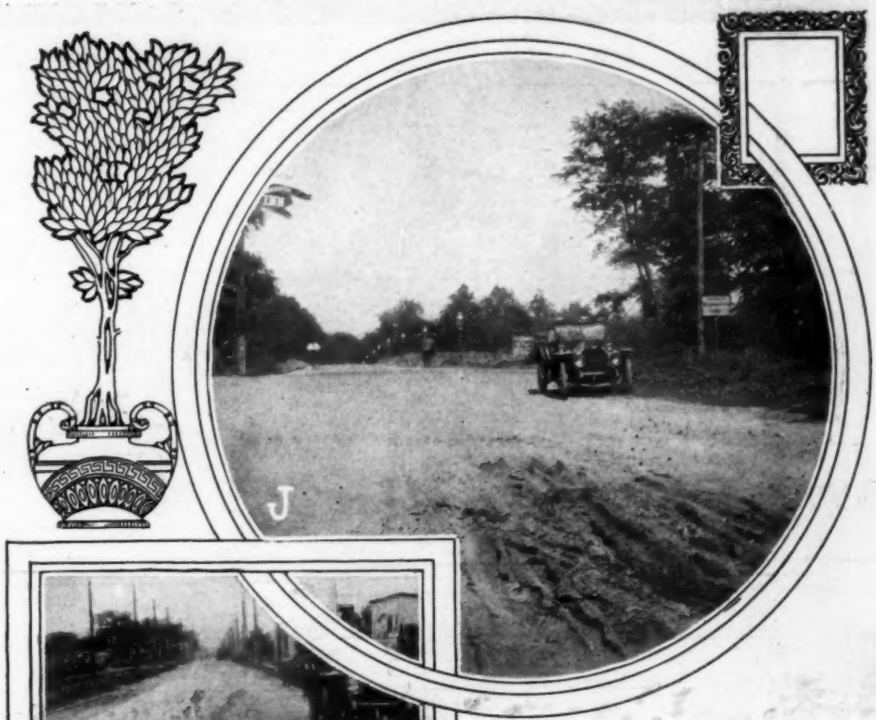
Nobody would keep a pair of worn-out shoes for their former association. Such articles, no matter what has been their usefulness in the past, are not decorative and are of no service. They occupy a place that belongs to something useful or beautiful and the only logical thing to do with them is to consign them to the scrap heap. And there, unqualifiedly as far as the city is concerned, belongs the horse.

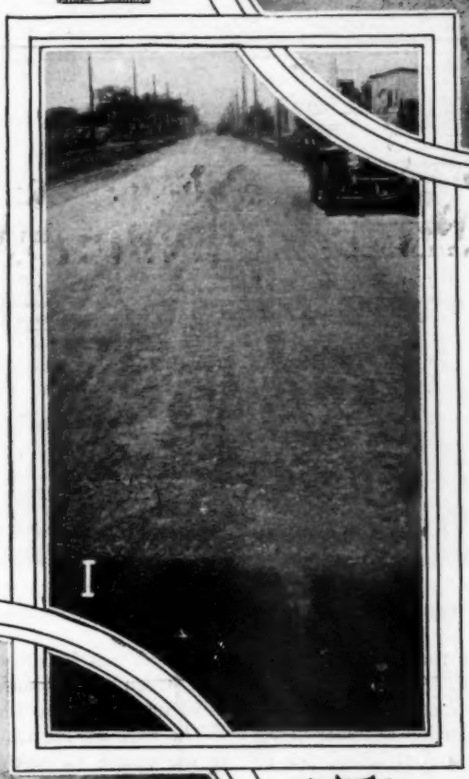
The Scientific Side of Road-Building

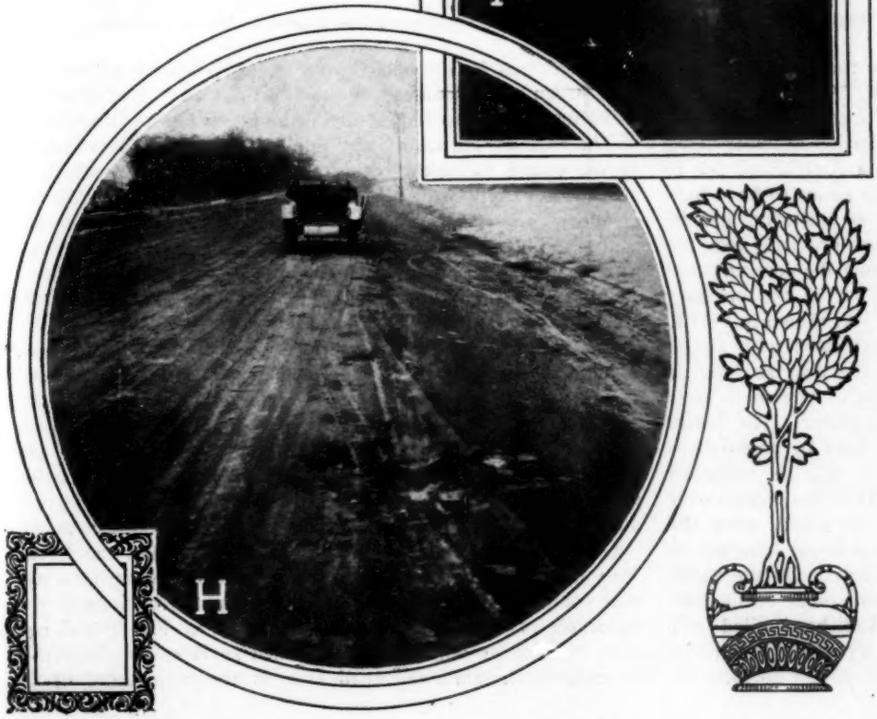
In the making of roads there are two things that must be paramount in the minds of the builders, and they are that the road surface shall be more or less impervious to moisture and that the under bed shall be properly drained. It is not proposed here to deal with road-making in the detail form but rather in the abstract. Until the advent of the automobile the point that had to be borne in mind was the tractive effect of horses, and in this respect the efficiency of the draft horse depends upon his footing. If that be good he can use his entire strength, but if the road surface is hard and slippery the power that could be used in overcoming the resistance of the load will have to be divided in so far as he will only be able to use the power he possesses until the slipping point is attained. The metal of the horseshoe and the hardness of the road surface are diametrically opposed to the hardness of the road surface and the elasticity of tires. Besides, a hard road will tire a horse out much quicker than a road that offers a certain degree of elasticity, or "give." To carry the matter still further, after the elastic limit is reached, as in the case of soft sand, the hoof sinks in and the tractive effort is reduced.

The metamorphosis that has taken place in the last decade has given food for thought to the designers of roads, and with the overwhelming increase of mechanical traction and the use of resilient tires conditions have altered alarmingly, and what previously may have been found to answer will have to be altered to suit present and coming conditions or new ones will have to devised where the old ones are found wanting.

One feature that has been tackled in a somewhat half-hearted manner is the dust nuisance, and it is admitted that in this particular the mountain will have to come to Mahomet rather than that estimable gentleman to the grade. Some cars are less inclined to raise dust than others; nevertheless if the dust is not present one of the greatest drawbacks will be eliminated. The logical method of overcoming dust is to construct roads that are homogeneous as to surface and that can be cleaned either by mechanical means or by the gentle rain from heaven. As an illustration of a road that is dustless and at the same time suitable for the new locomotion, that is shown in Fig. A offers excellent advantages. It is situated in the Bronx Park and has been built by the Park authorities. The road bed is of concrete and the surface is made from cement bricks set in with tar, in a manner similar to that used on the wood block roads. It has been laid now a matter of a little over twelve months and is almost exclusively used by automobile traffic, pleasure and freight alike. Running alongside the Pelham Parkway, it offers a handy means of comparison between the average macadam road and the dustless qualities of the block pavement. Fig. C shows a car traveling over the cement blocks, that have become somewhat shiny with the continual roll of the pneumatic tires and Fig. D represents the same car traveling over the Parkway at precisely the same rate







H—Another example of a road surface running parallel to that shown in Fig. G, but with a surface so soft that even a person's footprint makes an impression on the surface. The road shown on the right of the picture is being prepared for a tar surface

I—Part of the White Plains road, showing two types of surface. The light surface is concrete with a cement wash covering and fairly well cambered, whereas the blacker section shows the existing road covered with a tar material and is torn to pieces on a hot day by the calks of the horses' hoofs

J—This is a strip of roadway between two stretches of cement block roadway and it is proposed to replace it in the near future with the cement blocks

of speed. In the first illustration there is not a particle of dust being raised, whereas in the second picture an impenetrable cloud is left in the wake of the car. Reference to Fig. D clearly shows the camber of the new form of road, and it is evident that after a downpour of rain it will be self-draining as far as the surface is concerned. In dealing with this point one thing that has to be borne in mind is the porosity of the substance of which the road surface is made, and it is conceded by authorities that 2 per cent. is the maximum. This is necessary owing to the liability to disintegrate under the action of frost if the adsorption is greater. A general view of the road under consideration can be obtained by referring to Fig. E. The cleanliness of the surface is in a measure due to the absence of horse-drawn traffic.

The method employed in this instance of finishing off the sides is shown at F. The sides of the road are formed by blocks similar to those used in the running surface, with a

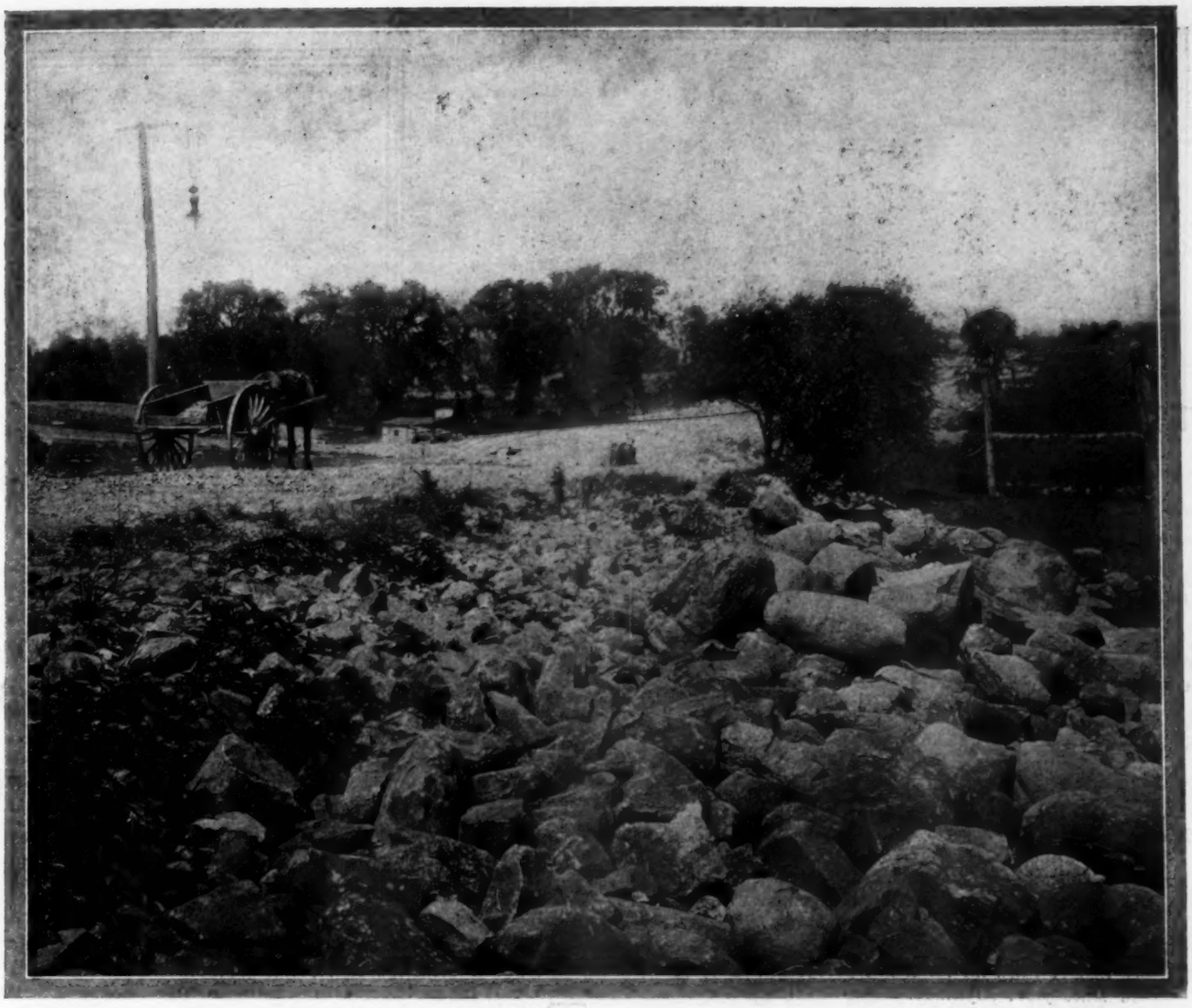
K—View taken recently of the existing Boston Post Road about a mile after it leaves the White Plains Road and about to be widened

side banking of cement tapering up to the road surface in the form of a triangle, in the manner illustrated. As was shown recently in THE AUTOMOBILE, in making roads of bricks and concrete blocks, there is a necessity for an expansion chamber along the sides to take care of the expansion and contraction due to the changes of atmospheric conditions. This seems to have been overlooked in this instance, but as there are no sidewalks and the road is not bounded by a solid substance, such provision may not have been found necessary. In order to show the cement banking some earth had to be scraped away, but in the ordinary course of events the road edge is similar to that shown in Fig. E.

Fig. G represents a road that had been treated with an oil preparation that has two effects. It lays the dust so long as the surface remains unbroken and the action of pneumatic tires thereon is to bind the upper crust firmly together. The center part of the road shows the section usually used by automobiles while on the left and right hand sides it will be remarked that the oil surface has been broken and this is the section over which the horse's hoof comes in contact. Of course after the calks of the hoofs have started the damage it is not long before the infection spreads to other parts of the road. On the right-hand side of this picture will be noticed two other roads running parallel. The one in the center has been oiled and sprinkled with fine sandy siftings and is very soft and entirely unsuitable for automobile travel. An idea of the softness of this road can be gleaned from Fig. H, where it will be seen that even the imprint of the pedestrians' feet cuts the road up and if the foot is drawn along it cuts up the surface.

The road on the right-hand side of this picture shows a road in the course of making or rather fixing up. Belonging to the macadam variety with a stony surface bound together in conventional form it is at present being coated with a tar substance. This will tend to make a dustless surface, but upon examination it was found that the surface was not homogeneous at all and a slight kick sufficed to break the surface and mar the smoothness. It is little use covering such a road with a dustless surface if the foundations are not fit to take it and stand the wear and tear. This brings one to the point that it is so much money thrown away to try and convert otherwise unsuitable roads into good ones by placing a covering over them. It will be found necessary in the near future to remake such roads and the money could be used to better advantage in experimental work rather than in covering miles of roadway with what has been found from experience to be a makeshift.

On the White Plains Road just before it strikes the Boston Post Road and the Pelham Parkway there is a stretch of road that compared with that immediately alongside of it in a very favorable manner. The surface is shown in Fig. I and consists of concrete with a cement-washed surface. In the heat it remains solid, while the road seen in the foreground of the



L—In widening the Boston Post Road boulders are being used to form a roadbed and the illustration depicts the heterogeneous class and size of material being employed. It is proposed to widen the road to the posts seen on the right-hand side of the picture

picture is one with a tarred surface and the horses' hoofs tear it up and render it useless. The average road surface that has received little treatment at the hands of the engineers is shown in Fig. J. No amount of fixing will ever bring such a road up to modern requirements until the foundations have been reached and built up anew.

Talking about foundations brings one to what are the best forms of foundation that have given satisfaction in the past. It has been found that foundations should be made of material of approximately the same size and this condition is obtained by crushing the stones that form the bed and passing them through suitably contrived apparatus so that they will pass the four-inch hole, grading to a smaller size the nearer the surface they are required.

Fig. K represents part of the Boston Post Road now in the contractor's hands to be widened and partly rebuilt. The position of the car in the illustration shows how far it is possible to go at the present moment. The road is being considerably widened at the present moment at this point, and it is interesting to see how this is being done. Instead of using the method above described boulders of all sorts and sizes are being dumped in the manner shown in Fig. L and the posts on the right hand side of the picture show the increase in width to which the new road will extend. The saving in labor in the method being employed is, to say the least of it, enormous, and instead of striving to improve the roads such crude methods as these seem futile.

No matter what material is employed for the road surface there is one vital point that must be borne in mind, and that is that the crust must be so made that it will remain intact or when signs of wear become apparent such repairs must be made in order to reinstate it. The reason for this is obvious. If the upper crust is made waterproof the rain will run off and suitable means must be used to carry this water away in the nature of ground drainage. If this is not the case the substrata will be loosened and cause the road to cave in in parts. The greatest damage inflicted on roads is undoubtedly that caused by the calks of horses' hoofs, as in the endeavor to perform their allotted work it is necessary that these calks should dig into the surface so that the horses can obtain a foothold. The fore feet are usually fitted with shoes with one calk or a toe weight to lengthen the stride, while the hind feet are invariably fitted with three calks. These calks will in time penetrate the surface and the next downpour will materially assist in enlarging the hole.

The Trend of Events—

POINTS to the building of good roads, remembering that they should be maintained as well as constructed—the old way has to do with the expending of money in the building of roads, and the high disregard of the maintenance of them.

A—End of the lake in the City of Geneva with Mont Blanc in the distance

B—Scene on the Riviera during one of the motor boat races

C—Many beautiful roads skirt the lakes amid snow-capped peaks

Geneva to th

Via Trans Alpine Au

Before the close of next October it will be possible for the touring automobilist to reach the Riviera, via Switzerland, over a 452-mile route, using his car all the way. Even now the road, although several links are not yet completed, is in constant use, the travelers shipping their cars over the uncompleted portions of the route in specially constructed goods wagons attached to electric trains.

THE longest and most pretentious public automobile passenger route in the world, namely, that of 452 1-2 miles, from Evian-les-Bains on the Southern shore of Lake Geneva, Switzerland, to Nice, "Queen of the Riviera," on the Mediterranean Sea, was opened for traffic with appropriate official ceremony on the first day of July. The entire trip over this romantic highway is made by passenger automobiles, with the exception of two or three very short links over the Alpine Road, where electric train service is being used temporarily. Across these spans of metal the motor cars are conveyed in especially constructed goods-wagons to the points of the completed automobile roads, where they are unloaded and put into commission again, taking up the thread of the journey. By October of the present year the portions of the route which are now served by electric train will have been completed, thus making a continuous automobile highway from frost-laden mountain and lake to sunny azure sea. The journey occupies five days, and affords a constant succession of delightful views.

Beginning with "Evian the peerless," the first day's trip takes in the walls of the ancient Château de Ripaille, the Dranse Valley, the Devil's Gorge, the Col des Gats, the entrancing Giffre and Arve Valleys, the gorgeous panorama of Callanches, the very shadow of Mt. Blanc, and the tranquillity of Chamonix. The second day includes the picturesque Col des Arvis, the Annecy and Bourget lakes, the Arley Gorges, the Little St. Bernard and the Vanoise, and through Aix-les-Bains to Chambery. The sun of the third day lights up the Calibier Col, the Lantaret, the majestic Meije, the Barre des Ecrins, a multitude of summits of the Pelvoux and fertile spots of the Guisane Valley, at whose

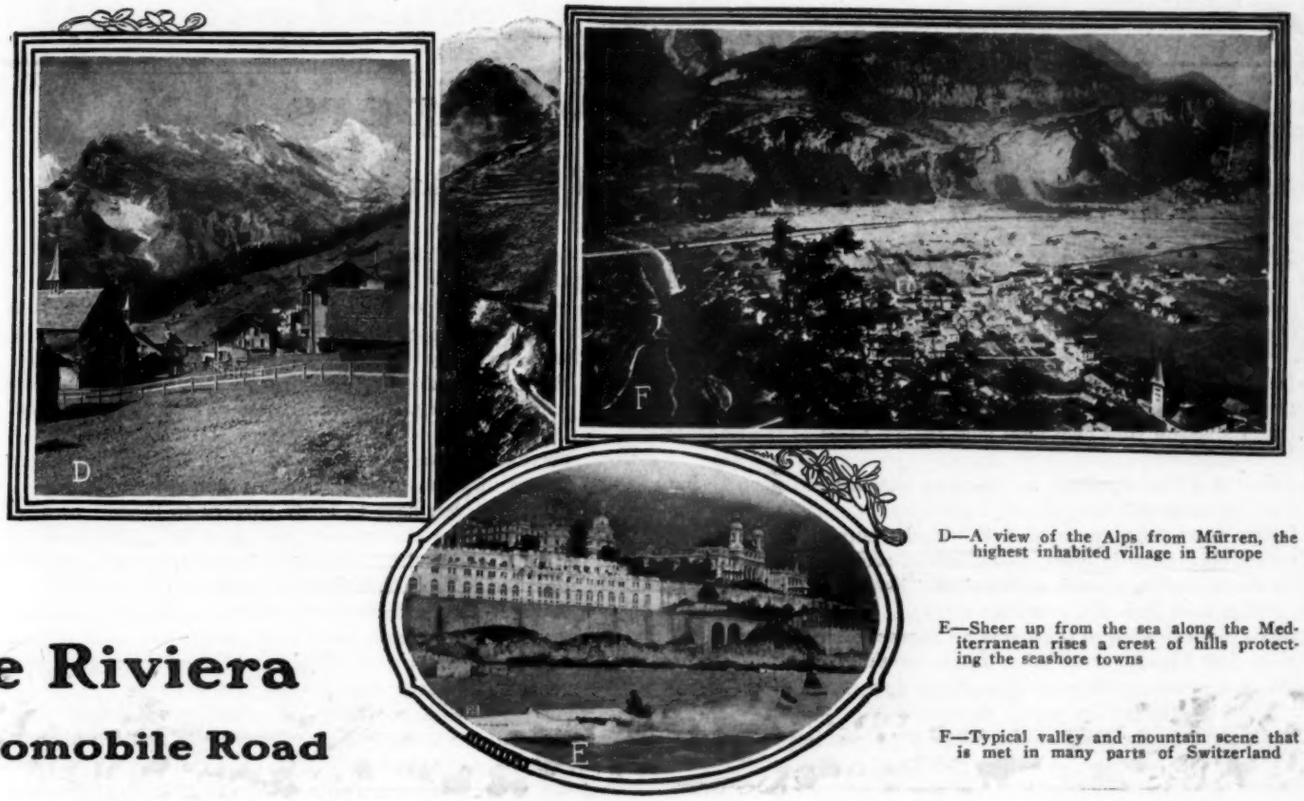
Tinkering on the Road

There is not a lot to be learned in order that the novice can successfully drive his recent purchase even on an extended tour, provided nothing in a mechanical way happens to upset his calculations. Some things happen that have to be attended to on the spot in order to get along at all, but it is the part of wisdom to leave experiments at the commencement to such time as when the car is in a garage instead of the open road miles from anywhere.

WHEN the novice takes over a new car and starts out for a day's enjoyment his pleasure may be marred by a persistency on the part of one of the spark plugs to foul up. Or at any rate, if it is not the spark plug something, perhaps, is amiss with part of the electrical equipment that is like so much Greek to him. There is a danger in tampering with several parts in the effort to locate the trouble, as the manner in which most novices locate trouble is to take the kit out and choose a tool indiscriminately, turning everything there is to be turned, with a fair chance of finding himself stranded. The road is not the best place to fiddle with the electrical equipment of the car without a previous and thorough understanding, as it takes very little on the part of the operator to render the entire system non-productive of a spark at all the plugs. This being the state of affairs, and supposing that one of the cylinders does not fire, it is most disconcerting to continue to drive with the motor in this condition and damage may result therefrom.

In order to postpone the locating of the trouble, if the ordinary tests have been applied, it would be better under the circumstances to remove the spark plug and drive the car at a moderate rate of speed either to the nearest garage or home, being careful not to run in the wake of another car and sucking up a peck of his dust.

WARNING GENERALLY GIVEN IN ADVANCE.—Just before the motor seizes, a pinging sound will be heard. When this warning is given, stop the motor at once and examine it carefully, or serious damage may result from a dried-up water system.



D—A view of the Alps from Mürren, the highest inhabited village in Europe

E—Sheer up from the sea along the Mediterranean rises a crest of hills protecting the seashore towns

F—Typical valley and mountain scene that is met in many parts of Switzerland

the Riviera

Automobile Road

extremity Briançon lies. The fourth day from Briançon to Barcelonnette, the road winds through the surprising Col d' Izard, the Col des Vars, the Queyras Valley and the awe-creating Mount Viso.

Leaving Barcelonnette early on the morning of the fifth day, automobile passengers find themselves admiring the Col d'Allos, the Colle St. Michael, the Verdon and the Var Valleys, Mescla Gorges and the alluring Côte d'Azur. Finally the satiated travelers alight, to find themselves as the day closes at their journey's end, with queenly Nice and her riot of carnival gayety spread before their eyes.

This high altitude highway opens up a surprising panorama to the tourist who has become weary of train travel or pedestrianism and seeks new glimpses of scenes which may be classed as akin to the sights of fairyland. The tariff per passenger is $38.70, not including hotel accommodations and meals en route, which may be figured at about $4 per day.

To tourists familiar with the Alpine summits and their relative valleys, this new highway is regarded as being unique, straggling away, as it does, in its serpentine course along the brinks of stupendous precipices, as well as penetrating the wilds of hazardous gorges.

Scintillating glaciers, dense patches of dark green woods, wide stretches of snow-clad plats, verdant fields, mighty mountains, streams leaping from boulders into seemingly bottomless caverns, roaring cataracts, mediæval towns, villages crowned with castles, limpid lakes and, finally, a dash into the semi-tropical zone, dotted with luxuriant gardens. These are some of the advantages enjoyed by the automobilist.

Perhaps as interesting a feature as any other in connection with this tour is the special goods-wagon for the transport of automobiles. The wagon is enclosed, affording the motor car a safe journey.

The owner of the motor car on a private tour may safely ship his machine from Paris to Evian and proceed to Nice, certain that his car is in reliable hands while connections are being made over the temporary electric lines. Likewise, this transportation is extended for the convenience of the automobiles making the daily tour over the romantic Alpine Road.

Kerosene for Automobiles

When it is fully realized that the only objection to using the cheaper and less volatile distillates of crude oil lies in the difficulty of their carburetion, it becomes evident that the chief line of improvement of the carbureter lies in their ability to be adapted to these fuels.

CARBON trouble must be charged in great degree to inferior carburetion, and that this source of trouble is becoming more acute every day is recognized, due to the fact that the non-volatile constituent in the gasoline supply is being increased from time to time at the cost of the more volatile hexane which is being decreased in the same ratio.

Fully 50 per cent. of all the volatile portion of crude oil belongs in the distillates approaching decane, and it can therefore be readily appreciated that the distillers of oil are extremely anxious to have decane liberally represented in automobile gasoline. It is not believed that they consult the builders of carbureters in matters of this sort, nor is there any record of their having called a convention of autoists with a view to being favored with its opinion as to the efficacy of kerosene oil for use in automobiles.

Surprising as it may seem, the inventors of kerosene motors have been put out of business due to the improvements wrought in carbureters and the splendid backing of the distillers of crude oil. Just as fast as carbureters are improved so that they are rendered more capable, the distillers of crude oil add another dash of the less volatile constituents until finally the carburetion problem has arrived at a near approach to the time when automobile gasoline may contain 50 per cent. of kerosene oil.

Since this is the exact amount of kerosene oil present in the whole content, there is no inclination on the part of the distillers of oil to add more—in fact, it would even be a detriment to do so.

THERE is a strip of coast-road along the Gulf of Salerno, in Italy, between Salerno and Sorrento which is not excelled anywhere in the world for perfection.

When Judgment Whispers Don't

(Aphorisms Apropos of the Automobile)

There are so many acts that may be committed with impunity if they are done at the proper time that the thought is suggested that reflection should accompany every undertaking.

DON'T adorn the fleeting moments with idleness.

DON'T work overtime on an undertaking that promises failure.

DON'T stand in your own light long enough to let your neighbors unhorse you.

DON'T stand in the light of the man who has no purpose but to treat you fairly.

DON'T exact "the ounce of flesh" if the surgical operation so represented is likely to defeat the project.

DON'T become too much attached to "distant verdure" even if it does look the greenest.

DON'T be persuaded to think that an impracticable idea will work just because some other fellow says it will.

DON'T finance any impossibility at the suggestion of the beneficiary under the plan.

DON'T derange the plans of the fellow who promises too much—let him alone.

DON'T invite mere schemers to join you in your everyday enterprises.

DON'T strike the blow that will kill the goose that lays the golden egg.

DON'T listen to the North wind while the South wind robs you of your enchantments.

DON'T scatter aimlessly the thought which, when properly managed, will count on the side of equity.

DON'T incorporate into a mechanism the disorders of a severe climate.

DON'T build an automobile so poorly that you will have to try it upon the dog.

DON'T burn the midnight oil assiduously for no better purpose than to purchase a necklace for despair.

DON'T go to a body-making plant for a good automobile—they are fashioned in machine shops.

DON'T put a poor-looking body upon a well-made chassis—it is like hiding your light under a bushel.

DON'T neglect business for the purpose of purchasing an inferior make of automobile—you will suffer a double loss in the interim.

DON'T place your crest on the panel of an inferior product—you might be taken at your own estimate.

DON'T try to turn the course of logic and of truth—these streams flow in a bed that was fashioned by the hands of time.

DON'T join the squadron of the discontented—act with wisdom and your path will lie in the opposite direction.

DON'T help to fill the storehouse of poor ideas, or lend financial support to projects that have no stamina.

DON'T pay the price of an uncanny idea offered you by a canny man.

DON'T forget that curses, like chickens, come home to roost—uncalled-for abuse of the repairman may result in a "brood."

DON'T order a green color for the body of your automobile if you reflect the same color in your actions. The two shades may not match.

DON'T rely upon a superficial examination of a car that is to cost you coin of the realm.

DON'T be afraid to talk up in meeting—the agent, perhaps, is a trifle deaf.

DON'T misjudge the power of action—if you act as if you have a sense of proper discrimination the dealer will take his cue accordingly.

DON'T risk the idea that supreme happiness comes with the possession of a car—delights desert the owner of a poor affair.

DON'T purchase a manicure set in substitution for tools for the tool-kit of your automobile.

DON'T despair if you have to apply surgery to the car of your choice—cutting out some of the bad ideas might have the effect of giving the good ones a better opportunity to perform their proper functions.

DON'T serve as the "evidence" if a fraud is being perpetrated nor play the principal part.

DON'T live in anticipation of delights to come if you give your money to the second-hand man first.

DON'T discourse with the seller at considerable length about what you are to get for your money—let him tell his part of the story in writing.

DON'T waste too much time on a highly accomplished salesman—your need is in the shape of a highly accomplished automobile.

Stopping the Car Quickly

Although the careful driver rarely allows himself to be caught in such a position that the safety of the car and its occupants depends on the ability of the brakes to immediately arrest forward progress, it sometimes happens that a quick stop is highly desirable. The sudden stoppage of "the car ahead" is a case in point.

IT occasionally happens that skidding occurs when the autoist is endeavoring to bring the car to a stop within a limited space. No matter what the condition of the roads, whether wet or dry, it is at times difficult to pull up quickly if another vehicle has suddenly stopped a short distance ahead of the car. Setting the brakes introduces side slip at the rear, and while this tendency can be checked by means of the steering gear the forward skid will continue in many cases. The fault is, of course, on the part of the autoist in having approached the other vehicle at too great a speed consistent with the state of the road and with regard to the efficiency of his brakes. To obtain the maximum retarding effect under such circumstances, the brakes should be applied and released alternately with a quick vibratory motion of the foot, a powerful braking influence being thus brought to bear on the wheels, and the intermittent periods when they are free to roll enabling them to maintain their grip on the road.

Willing to Give Him Another Chance

An Irishman who was sent to clean the windows of the 27th story of a sky-scraper lost his hold, violated the speed limit in falling to the pavement below, and a mob quickly collected, when one spectator said: "Poor Pat is no more!"

Pat (opening his eyes at the sound of voices): "Sure and Oi'm not dead!"

Convenient Cop: "Wait a minute; here comes a big limousine!"

Items from Foreign Lands

Interesting extracts, mainly from the United States Consular Reports, in which the status of the automobile in foreign parts is tersely set forth, and the prospects of extending the American market are called to the attention of those interested.

HONGKONG and Canton are two cities in China which are entirely unfit for motor car traffic, owing to the narrow streets. In some instances the roads are little better than mere footpaths, being from 4 feet to 6 feet wide. Sharp turns abound here and there, while at intervals in the road the automobilist encounters steep flights of stairs. Shanghai offers more encouragement to the motor car driver, the streets being quite wide, a fact which may, in a measure, account for 400 automobiles being found in the city.

The "foreign devil" who invades the Celestial Empire is not justified in feeling too sanguine as to his ability to penetrate into every section in an automobile. He will find himself absolutely barred from certain walled cities. He may drive to the very gates with his motor car, but here he will find himself facing a cluster of very disagreeable obstacles, including the police, mobs of coolies, swarms of "the people" and bands of residents who, with arms raised in the attitude of horror and hostility, threaten the automobilist who dares to make an attempt to pass the gates. Popular prejudice cries out angrily against foreign invasion.

The Swiss are going in for very heavy motor trucks for use in the Tyrolese Alps. These vehicles are built to carry very heavy loads up the steepest mountain grades. To this end the 40-horsepower engine is being utilized. Horse-drawn vehicles have disappeared almost entirely from these mountain highways.

Halifax has just acquired its first motor truck. Its appearance on the street aroused a good deal of interest. It has a capacity for carrying three tons burden. Oil barrels will constitute its loads, for the time being, at least. The truck will run between Fairview and Dartmouth. The body of the truck was built in Halifax. The truck itself was made in this country.

Calgary, British Columbia, has kept pace with the times, in a motoring sense, the latest movement in that far-away section being found in the organization of the Calgary Automobile Club. The membership in the beginning was twenty-one. The fee for joining is $10. The literature of the club sets forth its objects, which include the making of good roads, the erection of signboards, the building of club houses, and legislation against reckless drivers. There are 300 automobiles in the city.

Italy's King is one of the most accomplished as well as enthusiastic automobilists in Europe. Not alone does he possess some of the finest motor cars made, but he can drive a car as handily as the experienced chauffeur. Besides, His Majesty is capable of repairing his own automobile, he being a practical mechanician.

Automobilists riding through Upper Studley, a community near Trowbridge, England, are apt to have their attention called to an unique pile which suggests that it might well be regarded as a monument to the (at least partial) passing of the horse in that vicinity. It is nothing less than a heap of cast-off horseshoes, weighing 150 tons, standing 17 feet high and measuring 10 feet on each side. The value of the iron is at least $2,000. The owner spent two years in collecting the shoes for a curiosity.

Marmon "Thirty-Two" in Detail

Apart from Refinements Will Remain Unchanged

In presenting the latest type of Marmon it will be noted that there has not been any attempt on the part of the designers to make radical changes in design, and it is rather a matter of sticking to adopted lines and tried plans. One size power plant is employed for the several types of body work and the detail parts show accessibility and consideration for the user.

THE plant of the Nordyke & Marmon Co. is located at Indianapolis. By increasing the size of the factory from time to time another industry has been added to its former field of endeavor, the automobile end now being as large as the milling machinery business which forms the other half and which has been established for over half a century.

It is the aim of the builders of the Marmon to make as much as possible of its automobile product in the one factory, and,

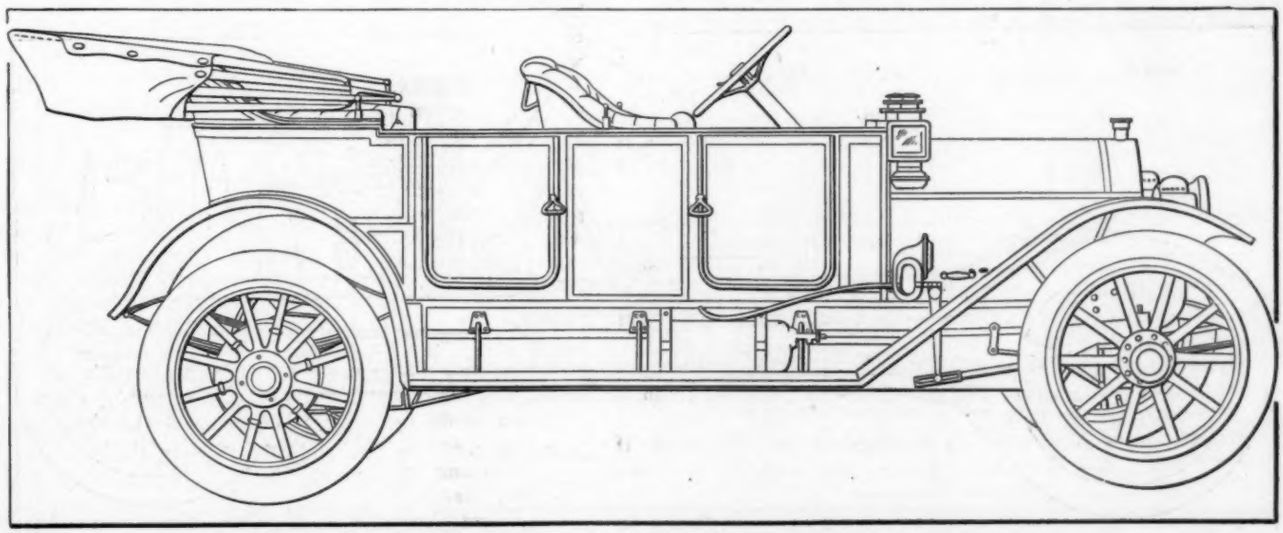


Fig. 1—Marmon "Thirty-two" with five-passenger fore-door touring body of straight-line design

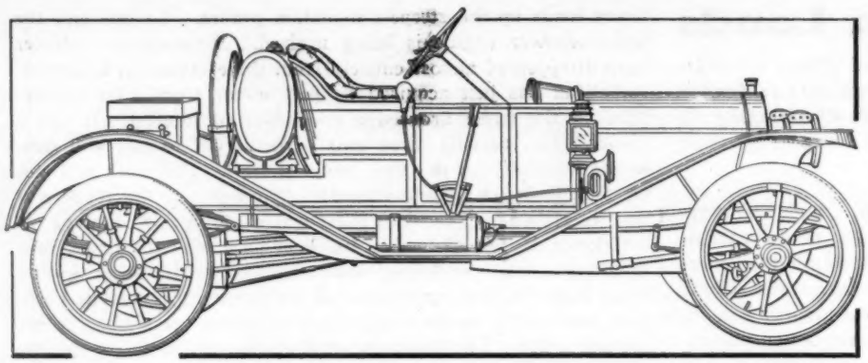


Fig. 2—Showing the Marmon Roadster, with oval gasoline tank and provision for storing the spare tire

with the exception of smaller accessories such as ignition apparatus and the like, the car is built from the ground up under one roof. According to those in authority the yearly model will soon sink into oblivion, and such improvements as may be found necessary or desirable for the betterment of the product or the convenience of the users will be incorporated in the cars as soon as the series allows. It is the intention of the Marmon company to increase the output for the coming season, and the previous year's "Thirty-two" will remain unchanged in most respects.

The comfortable-looking five-passenger touring body, with closed front shown in Fig. 1, indicates that the question of weight has been carefully studied, the passengers on the rear seat being bestowed within the space allowed for the wheel base, and as there is no overhang of the body the riding qualities are thereby enhanced. The mud guards are fitted with inside valances, thus protecting the body and passengers on dusty and muddy roads.

The Roadster model shown in Fig. 2 bespeaks forethought in one vital particular. The spare tire is always a matter that, unless proper provision is made for it in the design of the body, becomes an eyesore, and the method employed in the case in point places it in an accessible position, yet out of the way, so that it is less likely to be damaged by continual handling and the action of the elements. The gasoline tank, placed immediately behind the driver's seat, is oval in shape, with sufficient head allowance to dispense with pressure feed. The gear lever is placed inside the front door, with the brake lever placed on the outside, thereby reducing the width of the body, which is fitted with a cowl in the front for better protection of the occupants. The equipment of the Roadster includes a trunk placed on the rear with suitable covering for protection of the contents. It is surprising how dust will find its way through the smallest crevice unless such a covering is provided.

The general appearance of the front of the touring car can be seen in Fig. 3, showing the headlights carried on offset brackets with a tie bar so that no interference will upset the efficiency of the cooling qualities of the radiator. The bodies are made in the factory, and are somewhat unusual in that instead of being built up from different woods, with sheet metal panels, the base together with the door frames and doors are made from cast aluminum.

The general aspect of the chassis can be gleaned from Figs. 4 and 5, showing the right side and plan views respectively. The chassis suspension as seen in Fig. 4 is taken care of by semi-elliptic springs on the front and full elliptic springs on the rear, the lower half of the latter being clamped to a bracket which is free to oscillate around the axis of the axle casing. The rear springs are 40 inches long and 2 inches wide. The front springs are 35 inches long and the same width as the rear springs, but instead of being placed on the axle equidistant from the front and rear they are 15 inches from the front and 20 inches from the rear, which allows of carrying the radiator on the plane of the axle.

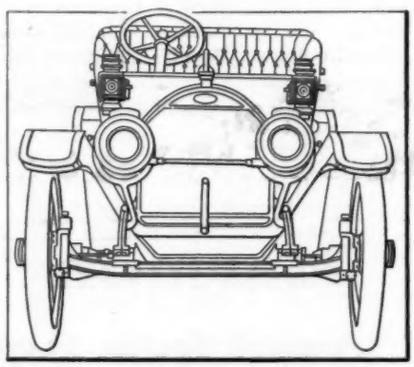


Fig. 3—Front view of the five-passenger touring car, showing the offset lamp brackets

Three-Point Suspension Supports the Motor

The plan view of the chassis (Fig. 5) discloses the disposition of the various working parts and the tapering of the frame from a broad section beneath the dash toward the front and rear together with the general arrangement of the brake levers and the radii rods.

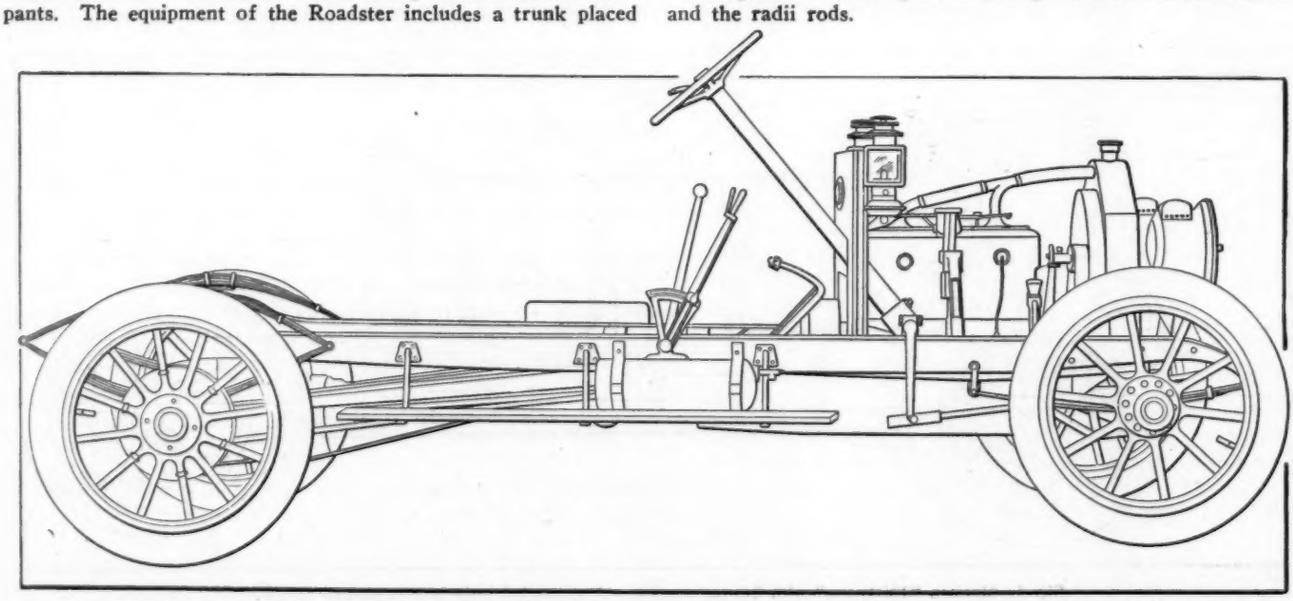


Fig. 4—Chassis of the Marmon "Thirty-two," showing method of suspension—semi-elliptic springs on front and full elliptic on rear

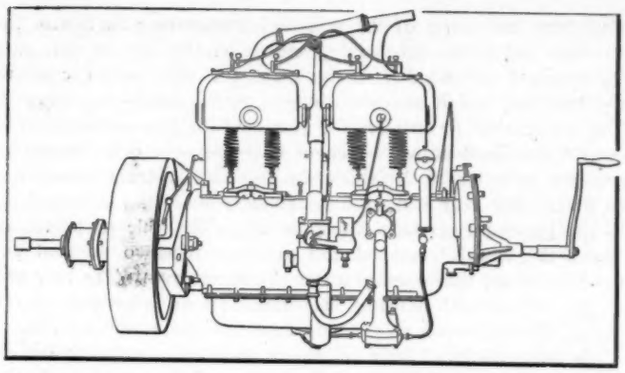


Fig. 6—Intake side of the motor of the Marmon "32," showing the low-hung carbureter

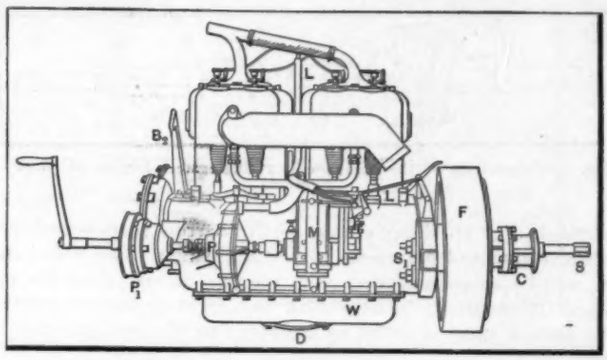


Fig. 7—Exhaust side of the motor, showing method of driving the pump and magneto

The four-cylinder motor is of the four-cycle type, with the T-shaped cylinders cast in pairs. The bore is 4½ inches and the stroke 5 inches. The cylinders are cast from a special grade of iron, with the exhaust and intake valves on opposite sides. The crank chamber is of the barrel type with a separate bottom serving as an oil reservoir, both of which are aluminum castings. One of the features of the Marmon motor is the intake manifold. One pipe is taken from the carbureter and is attached to the cylinders on the side between the two cylinders by means of locking rings. This virtually transforms the intake passageways of the cylinders into a hot-water jacketed manifold, permitting good carburetion at slow speeds as it eliminates condensation.

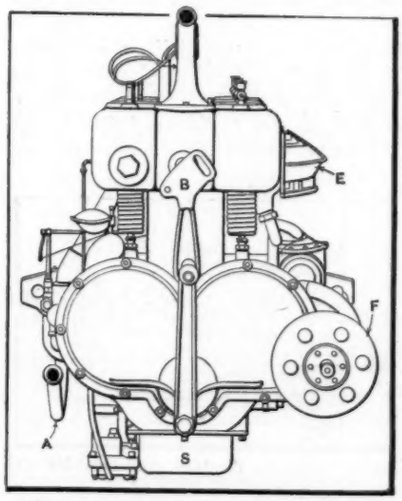


Fig. 8—Front of the motor, showing the form of valve tappets used and method of securing the valve springs

The front end of the crank case is extended, affording a bearing for the starting crankshaft. The motor is mounted with a three-point support, the forward end attached to a trunnion resting on the channel cross-member and the rear end is carried by a pressed-steel support, S_1 in Fig. 7, the ends of which are attached to the main chassis frame. In order to obtain a straight line drive the motor is inclined slightly towards the rear. The crankshaft is a steel forging of ample section (Fig. 9), with three main bearings.

Fig. 6 shows the right-hand side view of the motor and the low-hung carbureter. A Schebler carbureter of the water-jacketed type is employed to provide the mixture, the water being furnished for the heating through a copper pipe from the front pair of cylinders, a cock being placed in circuit to shut off the supply if desired. The oil pump can be seen in the illustration driven by gearing off the right-hand camshaft; a breather being fitted at the front end of the crank chamber to pour the oil into the base as may be desired. Fig. 7 shows the method employed in driving the pump and magneto. On an extension of the camshaft in front of the half-time gear case there is a pulley which through the intermediary of a flat leather belt drives the fan placed behind the radiator and attached on the bracket B_2. The pump shaft has an Oldham coupling to facilitate dismantling, and the magneto M is driven by an extension of the pump shaft which also has an Oldham coupling. In order to remove the magneto M all that is necessary is to loosen a thumb nut that holds a spring steel band in position and the magneto can be lifted off the shelf on which it rests. The valve tappets have screw and locknut adjustments and are fitted with hardened steel rollers riding on the cams. The tappet guides, turned out of white brass and held in place by a pair of crow feet are fitted with dust caps over the tops. The form of tappet used may be seen from Fig. 16. The tappet T accommodates the screw A; at the other extremity there is a roller R which has a bronze bushing mounted on a hardened steel pin. The guide is slotted to accommodate the flat sides of the tappet foot and thus prevent it from turning. The valves V and V_1, for the intake and exhaust respectively, are interchangeable and have taper seats. The method of securing the valve springs can be seen from the same illustration. A counter-bored washer C fits over the valve stem and a small steel washer made in two halves fits into the grooves in the stem. The counter-bored washer fits over the split washer, holding the spring securely.

The motor is cooled by means of a cellular radiator supported on a trunnion. A dual system of ignition is employed using a high-tension magneto and a single coil, the latter being placed on the dash. The commutator in the magneto is utilized in distributing the current to the spark plugs, which are placed over the intake valves, in the event that the battery is used either for starting or emergency. The water pump is of the centrifugal type, of ample dimensions and has a tap placed at the lowest point of the circulation to drain off all water when this is found desirable.

The piston rings, which are of the triple expansion type, are

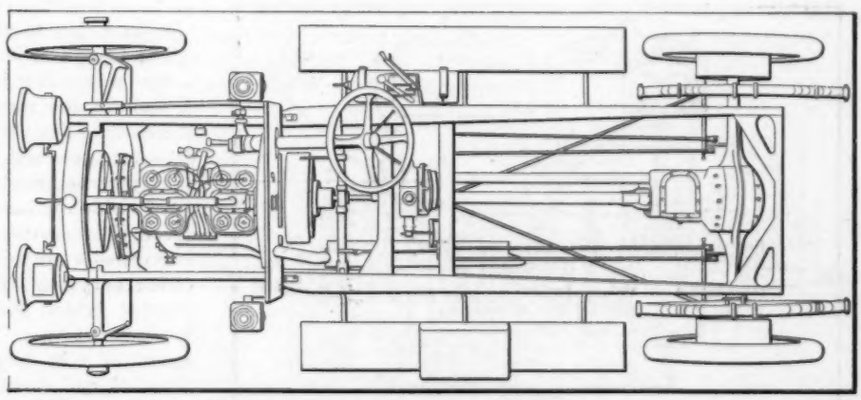


Fig. 5—Plan view of chassis, showing the taper frame and the disposition of the working parts

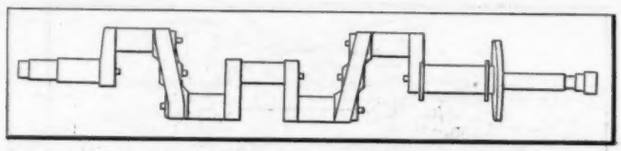


Fig. 9—Crankshaft of the Marmon is a single steel forging of large dimensions

shown in Fig. 11. They consist of two narrow rings placed over a wider ring and pinned to prevent oscillation. The wide rings R1 can be seen dismantled from the two narrow rings R2 and R3, R representing the assembled unit. The method of slotting the narrow rings in order to accommodate the pins can also be seen.

The part section of the motor shown in Fig. 10 shows the system of oiling used. The gear pump P, driven off the half-time shaft, draws oil through the lead A from the well in the base chamber through a screen and forces it through the pipe B to three main leads into the hollow crankshaft by means of the pipes M, C, D and K. The oil is then forced under the pressure exerted by the pump into the big end bearings of the connecting rods and up small copper pipes G and G1 to the wrist-pin bearings. The pressure of the oil can be regulated by a conveniently situated valve alongside the pump P, and the gauge G2 placed on the dashboard shows the pressure of the oil passing though the system. The pump is placed outside the crank-chamber and is readily removed. In order to register the amount of oil in the base there is fitted a float and level gauge O provided with a glass window. The big ends of the connecting rods dip into troughs and lubricate the cylinders and other working parts not lubricated under pressure by splash. The breather B1 is fitted with a hinged cover and the gases that escape past the pistons are given free egress through the orifice O1.

A cone clutch engaging in the flywheel is employed to transmit the power from the crankshaft to the transmission, which is located in the same housing with the rear axle and differential. The male member of the clutch is of cast aluminum, having an asbestos fabric covering riveted thereto, with relieving springs under the fabric to take the shocks of starting. The engagement is effected by means of a spiral spring located inside the chamber C in Fig. 7, and the thrust is taken by a ball bearing. The rear axle transmission unit is shown in Fig. 12. The propeller shaft is housed in the tube, the forward end of which is carried in a large ball-and-socket support within a dust and oil-tight aluminum housing on a cross member of the frame. Within the ball joint B2 is a universal coupling connecting with the drive shaft, and a second universal joint is placed forward within the clutch. The torque is taken by the main tube and the ball-and-socket joint. The pull-and-push braces R and R1 from the axle ends to the forward end of the tube hold the axle securely in right angle position, and truss rods with adjustments

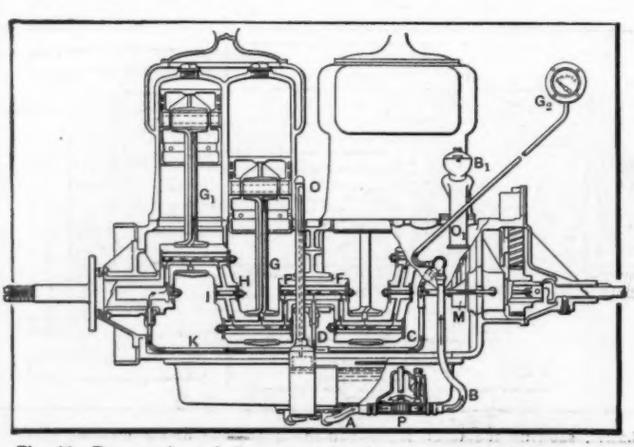


Fig. 10—Part section of the motor, showing the system of lubrication

pass from the center of the axle underneath the gear box to the forward end of the tube casing and under the axle proper, adding strength and rigidity to the structure. The box T contains the gear set, which provides three forward speeds and reverse. The oval casing T2 encloses the gear-operating rods which terminate in the front at A1. A cover C is provided over the transmission in order to replenish the lubricant therein from time to time. The rear end of the transmission casing is bolted on to the pressed steel axle casing at B1. The axle as presented shows the wheels removed and discloses the two internal expanding brakes that operate inside the same drum. The rear end of the differential housing is formed by an aluminum cover which when removed gives ready access to the working parts.

The disassembled parts of the transmission and the differential are shown in Fig. 13. The square sliding shaft with the pinions attached is shown at P and the shifting arms A and A1 may also be seen. The layshaft running on ball bearings is shown at S. A steel plate with integral bearing supports C and C1 for the journals of the differential, which also carries the adjustable pinion bearing and the rear bearings of the transmission gear set, is bolted within to the forward opening of the axle housing, and it is the removal of this plate through the rear opening which permits the easy and quick removal of the transmission.

The axle is of the floating type, the drive shafts are of large dimensions and are made of chrome nickel steel with square inner ends S1, Fig. 12, which slip into the differential and the integral flanges at the outer ends, riveted to flanges bolted to the outside of the wheels. The rear wheels run on a single ball bearing of ample dimensions. The brakes are placed parallel inside the rear drums on the rear wheels.

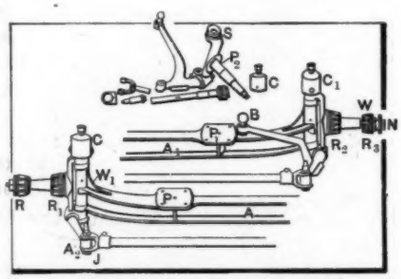


Fig. 14—Showing the front axle assembly and steering knuckles

A side view of one of the sets of brakes seen with the wheel removed is shown in Fig. 15. The brakes are of the internal expanding type and operate within a drum 14 inches in diameter, the width of each of the shoes being 2 inches. The shoes are faced with asbestos fabric and the ends of the shoes are fitted with slots that correspond with the spacers D, D1 and D2, which with the aid of springs S and S1 give to the whole a floating ring construction and prevent chattering and rubbing when the brakes are not in operation.

The adjustment is effected by means of altering the position of the operating cam C by means of a worm and sector placed under the front floor boards, a separate adjustment being provided for the foot and emergency brakes. The brake drums are of pressed steel, being secured to the wheel hubs by means of bolts and clips to alternate wheel spokes.

The front axle is shown in some detail in Fig. 14, from which it can be seen that it is an I section drop forging as indicated at A and A1, the spring perches P and P1 being forged integral therewith. The steering yoke S and the spindle P2 are also drop forgings, and the point of attachment of the yoke to the axle is strengthened by means of the web W1. Ball thrusts are fitted inside the head to take the weight of the load and a dust cover C is provided, into which is screwed a grease cup for lubricating purposes. The tie rod is situated behind the axle and is attached to the arms A2 by means of yoke forgings that are threaded and screwed inside the rod; a split clamp is fitted and held firm by means of a bolt.

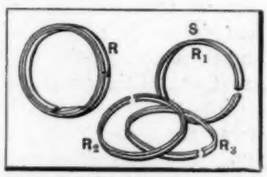


Fig. 11—Showing the triple-expansion piston rings

The pins that pass through the yoke and attach it to the lever arm are of hardened steel working in bronze bushings and fitted with oil cups. The wheels are carried on roller bearings R, R1, R2 and R3, and are attached to the spindle by means of a nut N and a washer.

The wheelbase of the standard model is 120 inches and the tread is 56 1-2 inches. The clearance allowance has been well thought out and has been fixed at 10 inches, which should be sufficient for the average road over which automobiles are intended to travel with safety. The road wheels are of the artillery type, 34 inches in diameter; but 32-inch wheels can be had if the purchaser so desires. Quick detachable rims are fitted to all wheels and these are shod with 34x4-inch tires. The weight of the car is 2500 pounds with the tanks filled but without passengers.

Oiled Roads in Canada

Dominion highway authorities are satisfied that crude oil sprinkled on the roads has demonstrated its value as a dust preventer. The city of Toronto has discarded the use of water entirely in sprinkling certain streets, and has substituted a light oil with an asphaltic base.

THE highway authorities in Ontario Province, Canada, have come to the conclusion that crude oil sprinkled on macadam roads is proving itself a very satisfactory material for keeping down dust. They have also declared that by this means the damage done to adjacent fields of grain is greatly diminished.

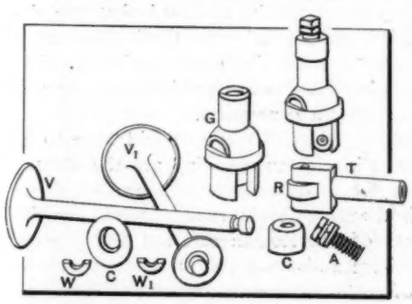


Fig. 16—Assembly of the Marmon valves and tappets

Toronto city makes use of oil to a wide extent, having discarded water altogether for sprinkling certain streets. The authorities say that they prefer oils with an asphaltic rather than a petroleum base. The oil is sprinkled from a cart—scattered and not allowed to collect in pools—the cart being driven at a fairly rapid pace. A man sometimes follows the cart with a broom to brush away any pools that may collect. A mixture of crude oil and limestone dust makes a toughened skin over the roadway, preventing dust and preserving the metal surface. Two or three applications of oil within a fortnight early in the Summer and then four or six weeks apart will suffice. About 1,500 gallons per mile will make the first three applications on Toronto streets, 24 feet wide. These oiled highways are the joy of automobilists.

CARE OF SPRING SHACKLES.—Spring shackles cannot fulfil all the conditions required in connection with a fast-running vehicle on a rough road; they may mitigate many of them, and if there is not great care exercised in the design and application, they may very easily greatly exaggerate evils they were intended to cure or prevent. The ends of the main springs are the points of connection with the chassis frame, and all the shocks which pass the tire and the main spring are transmitted through these points.

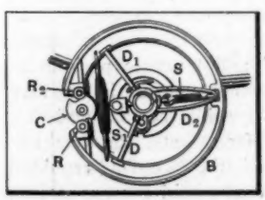


Fig. 15—End view of the internal expanding brakes

The wearing away of these parts is inevitable, and cannot, under any conceivable circumstances, be avoided. The arrangements made for lubrication, etc., greatly mitigate the wear, but it is taking place in a greater or less degree all the time the car is in use. The wearing away of the bolts and shackles is the result of friction concentrated frequently on small surfaces. The load over the springs is responsible for the pressure and the speed at which the car is being driven for the rubbing friction; the smoother the rubbing surfaces the smoother the working and the longer the time which they resist wear.

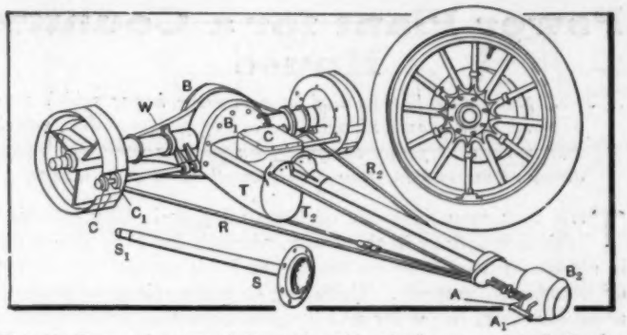


Fig. 12—Rear axle transmission unit, with wheels removed and showing the internal expanding brakes

"Soft" or "Nervous" Motors

A well-known engineer states that the discussion of motors coming under the above popular classification resolves itself down to a question of torque, and that under given circumstances resemble each other strongly.

THE distinction between "soft" and "nervous" motors, says A. Contet, is devoid of genuine merit and is dictated mostly by commercial considerations. A "nervous" motor has all the characteristics of a "soft" motor when overloaded. The question is one of torque at the various motor speeds. The torque of the short-stroke motor (or 110 by 120 millimeters) of the heretofore ruling design is generally superior below 1,500 revolutions per minute, while that of the long-stroke motor, developing the same power with 85 millimeters bore and 160 millimeters stroke, is superior above 1,500 revolutions per minute. With regard to the bearings of the long-stroke motor, Contet maintains that their rapid wear is simply due to the erroneous practice of using only two bearings for the shaft of a four-cylinder motor, which compels the use of very large diameters and consequently rapid wear of connecting rod bushings, due to the high linear speed. He considers that every "pushed" or "nervous" motor should necessarily be equipped with five crankshaft bearings for four cylinders, so that crackpin diameters may be reduced to their minimum, and that these bearings furthermore should be ball-bearing, so as to give room for widening the connecting rod knuckles and diminishing the pressures per square inch. By this means the pushed motor may be made just as durable in all its parts as the customary type.

JUST at the present moment there is an attitude of uncertainty among the automobilists of Canada, because of the changes which are apt to be brought about in the event of new tariff regulations going into effect. It is estimated that the duty on motor cars would be reduced at least 5 per cent.

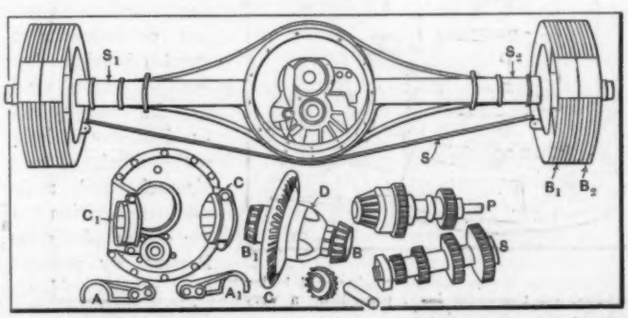


Fig. 13—Showing the Marmon transmission and differential disassembled

Power Plant for a Country House

A small plant may be installed in a country house which may be used by the owner for a variety of purposes and, which will in time, be found to more than pay for itself by cutting down repair and lighting bills as well as in convenience.

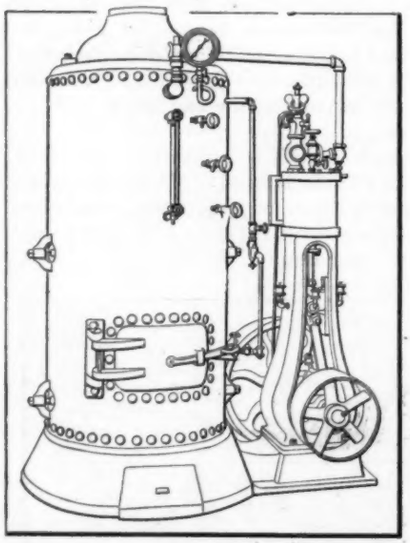
THE man who lives out of town all year is bound to find time, especially in the winter, when he would be able to put in some useful work on his automobile if his garage were heated or illuminated properly. There are so many things to be done about a country house for which a power plant of some sort is a necessity that it is very easy to secure a central plant which will take care not only of the garage and its appurtenances, but also of much of the other work, such as pumping, lighting and churning. The plant installed will, of course, be more or less elaborate according to the necessities of the particular case in point.

A small shed may be built in connection with the garage in which the boiler and engine may be installed. As illustrated in the cut, the engine is on the same base as the boiler and thus occupies very little floor space; an engine producing four horsepower, with the boiler, taking up very little room. Adequate clearance must be provided in installing the boiler to allow of easy stoking of the fire in the boiler.

From this engine may be driven a dynamo which will be sufficient to not only light the garage but the house as well. The engine may be used whenever it is desired, thus making for greater economy and a reduction of lighting bills. Besides doing the lighting, a belt may be carried into the garage which will run a main shaft, from which may be driven a small engine lathe or any other tools required, such as drill presses, etc.

In the Winter time it would be a simple matter to run a steam pipe into the garage from the shed, thus providing a simple and safe method of heating the garage under all conditions of temperature; and work which would otherwise have to be held over until more suitable weather conditions prevailed may be carried on in the most severe parts of the year.

The greatest advantages of a plant of this type over taking the power from a service line is that it may be used for anything the owner may desire, and that one will be able, with the same apparatus, to do all the heating as well as the other work at the very time it is desired. The power does not have to be paid for when it is not in use, as is often the case when taken from a service line, and it is not cut off at a certain time at night because a full moon happens to be announced by the local almanac. With a garage fully equipped with lathes, drill presses, etc., the cost of upkeep of the automobile would be reduced to a minimum. Valve grinding and all the other operations of repair and adjustment, instead of being done outside, may be made by the mechanician or chauffeur at home with much greater dispatch and under the supervision of the owner of the car. Paying for unnecessary repairs of parts will be avoided.



Illustrating a small steam engine and boiler situated on the same base, presenting a very compact and efficient plant

Another use to which the power plant may be put is in driving the water pump. The gas-engine water pump has been found to be very much of a nuisance owing to the very unpleasant noise which generally accompanies its work. A water pump which will be very silent may be driven by belting off the engine.

As to Road Building

Being a set of meditations on the nature of good roads, some conditions of their construction and an unusual way of looking at the problem of building them. Contending that history repeats itself, some principles will have to be followed in order to solve the question facing our time at the minimum expense of time and money.

DURING a recent meeting held in the South relative of the Good Roads movement, one of the speakers made the appalling statement that had such a meeting been possible half a century ago the Civil War would not have been necessary.

Knowing but this one passage of the speech in question, it is of course impossible to see just what consideration prompted the utterance quoted; nor is this the place to debate as to whether the statement was a well-founded one or not. But there is hardly a doubt that, had transportation facilities been different from what they were at the time of the war, history would have been written differently.

Since necessity works in history the same as it is active in the functions of an engine, it must be assumed that the development of history, as brought about by the Civil War, was a necessary one, and perhaps a beneficial one, despite the fact that the best of America's manhood was sacrificed thereby and evolution thrown back for fully a generation.

Coming back to the subject of good roads, it will have to be granted that the best roads in existence to-day are the Roman roads on one hand, and some constructions of later periods on the other, among which the Napoleonic roads deserve special mention. For the success of the Roman and the first French empire these good roads were a *sine qua non*, and it remains to explain the possibility of such enormous engineering feats at times when there were less humans available than at present.

The answer is that the cost of constructing these roads was comparatively insignificant, since the roads were built by either soldiers who were paid little in addition to what they had an opportunity of taking from the enemy, or by slaves whose support was but the cost of feeding them, food also being acquired without any expense in most cases. It was by the cheapness of labor that the construction of really good roads was made possible, and this state of affairs more than balanced the lack of powerful appliances at the time of building the Roman roads. As to the roads built under Napoleon Bonaparte's regime, there are quite a number of them in Europe, they being the only good roads in their respective territories. It is a moral certainty that the French did not pay cash for the labor involved in the construction of Napoleonic roads; but Bonaparte seems to have carried out the antique principle of forcing the vanquished to his services.

Comparing the great ancient roads of Italy, France, Western Germany and Britain with the modern constructions, the thought forces itself upon us that works like the Pyramids or the Church of Notre Dame could not be paid for when they were built, nor could they be built to-day if payment should be required.

It seems that the construction of truly first-class roads cannot be enforced except during such cruel and tyrannic periods as those of Caesar and Napoleon. For public comfort is too nice a thing to be disturbed for the sake of public benefit, and discipline is next to impossible in any free State, the one exception in history being the case of the Roman republic. Whether the severe principles then in vogue paid for themselves is left to the student of history to decide.

Patent Truths Concerning Varnishes

Discussing the Phases of Automobile Finishing

M. C. Hillick goes into the ramifications of varnishing work, discussing the merits of the methods in vogue and dwelling upon the shortcomings that are occasionally indulged in to the detriment of the results obtained. This article is intended to be helpful to the man who owns and operates a car, without in any way interfering with good workmanship as it obtains in plants of some distinction.

WE borrow trouble, carry burdens, and wince under the yoke of many things connected with the wear and tear of the automobile, but not infrequently lose sight altogether of a main source of expense. At present there is a great gulf fixed between the automobile owner and the garage zouaves, and to cross from hither to yon, or vice versa, means an expense, figuring in the aggregate, which the man of moderate means is not daring enough to face. The item of large expense here referred to, and for which the garage employee, or the understrapper around the livery barn, or the man-of-all-work infesting the premises of the car owner, is largely responsible, is that of varnish abuse. As explained in a former article, varnish, and especially the finishing coat, is at once the most expensive and the most sensitive material that finds an outer point of vantage upon the surface of the car. At the same time, under fair treatment it is one of the most durable things which serve to protect and beautify the car.

It would almost seem, taking a broad view of the situation today, that a campaign of education is needed to insure for the varnish fabric upon the car a manner of treatment entirely free from abuse. Prejudice, deep rooted habits, generously mixed with ignorance concerning the vital essentials in the care-taking of varnish, are the traits of human nature entering into the practice to discourage which this article is written.

Varnish has very much of human nature in its composition and to go on eternally heaping upon it all the forms of abuse listed in the catalogue of cruelties is to invite a volume of expense at which even the millionaire has a right to balk.

To begin right with varnish after it has been flowed and fashioned upon the surface with the good practice of the brush artificer it should in no way be disturbed or exposed to service until it is dry and firm enough to take a generous water bath without bruising or clouding it.

And this water bath, let us understand at the outset, should not be forced through a high-pressure hose held at an angle to strike the surface with the force of a solar-plexus. Rather should it be a gentle flow of water distributed, if preferred, through the hose, and given a light pressure wash with a soft wool sponge. Let the water be clean and moderately cold, and after sponging the surface thoroughly dry it off down to a water mist with a soft, clean, wash leather which you buy of the jobber under the name of chamois skin, although it was more than likely cut from a Colorado sheep pelt.

All this suffices for a first washing, and this should be followed as often as the car goes out and accumulates a plaster of road dust or a smear of mud, either of which mediums is destructive to the varnish if allowed for any length of time to remain upon the surface. The ammonia with which roadway accumulations are saturated, working in connection with other alkalies, and deleterious substances contained in dust and mud, are highly injurious to varnish. Indeed, there is no other agency, except hot water and fire, which will break down the brilliancy of varnish and permanently destroy its luster so quickly.

The need, therefore, of frequent water baths, applied in the manner described, is apparent. The abuse consists of first permitting these acid and actively destructive accumulations to dry and bake upon the surface or in washing them off with a powerful volume of water hurled at the surface at a high pressure. Abolish these two forms of abuse and you have cleared up two threatening and dangerous phases of the situation.

The next inexcusably bad practice consists in cleaning, or attempting to clean, the surface with waste or cloths saturated with various oils and smeary preparations, not a few of which are no more adapted for renovating or imparting life to the varnish than a skiff is suited to sail the high sea. All such mediums are too harsh and erosive in their effect upon the delicate field of varnish and they very soon nip off the sharp brilliancy which goes as a part of the well-finished surface.

Various emulsion cleaners have been, and are now being, recommended for the car surface to keep it bright and clean and to make the varnish wear longer. All such suggestions should be accepted by the motorist with several grains of allowance.

As to the merits of emulsion cleaners for the varnished surface upon the automobile, the question arises, What is the nature of an emulsion cleaner? Apparently some misunderstanding exists concerning this matter. An emulsion cleaner, under reasonable interpretation, carries ingredients consisting of water and alkalies, and, it may be, of acid. Moreover, it may also contain a percentage of oil. The oil is added in the case of some cleaners to neutralize the effect of the alkali, or the acid, or both. All such cleaners, however, are sooner or later—generally sooner—destructive to the varnish, and they should under no circumstances be used for automobile cleaning or renovating purposes. If you really wish to injure the surface to the extent that you would injure it with one of these innocent-looking emulsion cleaners, use common bar soap and water and save 90 per cent. of the cost of the emulsion cleaner.

If resort must be had to a cleaner other than water and possibly some light renovating body such as may be used upon pianos when the varnish has reached a certain stage of wear, employ a straight oil cleaner free from water, alkali or acid.

In any event, it is well to understand that a cleaner, be it oil cleaner or oil emulsion cleaner, or something masquerading under a more alluring title, should have nothing in its composition to blight or decompose the varnish. A straight, clean, soft-water bath applied to the car in the manner already directed is the very best treatment that can be given the varnish—as a matter of fact, it is the only treatment that should be permitted or tolerated—so long as the surface holds firm and intact and retains a fair degree of its original luster.

Reaching an advanced age the varnish may then, if so desired, be "flushed up" with some mild renovating medium containing a certain cleaning element in connection with a renovating and gloss-restoring ingredient.

Nevertheless, the sum of the whole matter is not to choke or throttle the varnish in the days of its youth by feeding it upon divers dopes of uncertain pedigree. Rather simply keep it clean by the application of water and common sense until the stage of decline sets in, whereupon either give it a fresh coat of varnish or apply frequently a renovating medium of established beneficial qualities.

Practical Automobile Repairs

Calibration of Parts Is Vital

Time is fast drawing nigh when it will be possible for the amateur to repair his own car with moderate success, but it remains for the manufacturer to co-operate with the owner and deliver parts that will not require a greater deal of fitting. When parts wear it cannot be expected that a new part from the factory will just fall in and be a perfect fit. It is no use putting a square peg in a round hole.

THE cry of standardization has been taken up wholeheartedly, and with the co-operation of manufacturers it will not be long before makers will have stocks of parts in different sections of the country, so that an owner of a car who finds himself in need of a new part to replace a broken or worn one will be able to obtain what he wants within twenty-four hours. It is still within the memory of many that one had to wait sometimes weeks for a spare part and in the case of some foreign cars the time bordered on the indefinite. This was an unfortunate state of affairs, but neverthless it has been to America's advantage.

The manufacturer's responsibility does not end with simply supplying a new part speedily. It would be hard to find anything more exasperating than after waiting for several days, perhaps held up in some country town, to find that the part sent was not the one ordered, or that it was a case-hardened part several thousandths of an inch too large. Such examples have been by no means of uncommon occurrence in the past. A case in point was recently discovered in a race, where the clutch thrust raceway, which was made of three parts, had become overheated and seized, necessitating the replacement of a new part, which in the ordinary way could be performed in ten minutes. The new raceway was offered up to the hole in which it had to fit and it was found that it was a matter of 0.0005 of an inch too large in diameter, and the unfortunate car was placed out of the race.

Jig work is fast becoming the usual method of manufacture in up-to-date shops, but a good deal depends upon the intelligence of the workmen in this rule-of-thumb method. One man is given a machine and a jig and he works from morning till night upon the same job, as, for example, drilling holes four at a time in a certain part. The drills must enter where the jig directs and the part must drop into the template or jig, but unless the locking of the jig is carefully executed the forethought of the designer will be nullified by an error that can only be found out in the running of the car.

Take, for example, the part shown at P in Fig. 3. This part connects the clutch to the transmission by means of an intermediary collar that fits over the squares of the part P and a corresponding part attached to the extension of the transmission shaft. The holes are drilled by two successive operations usually, or could all be drilled at the same time, for that matter. If the work is properly done, the fitter, when he comes to assemble the part to the flywheel F, will find that the holes S11, S22, S33, S44 correspond and register with the studs S1, S2, S3, S4, respectively. Then come the holding bolts that pass through the plate P through the holes H11, H22, H33, H44, and screw into H1, H2, H3, H4, respectively, and they may fit all right. The general appearance of the assembled parts is shown in Fig. 1. There still remains, however, the vital part of the work to be performed, and that is the outside calibration to correspond with the holes and studs and bolts. The alignment of the motor and transmission is dependent upon this, for unless the alignment is perfect

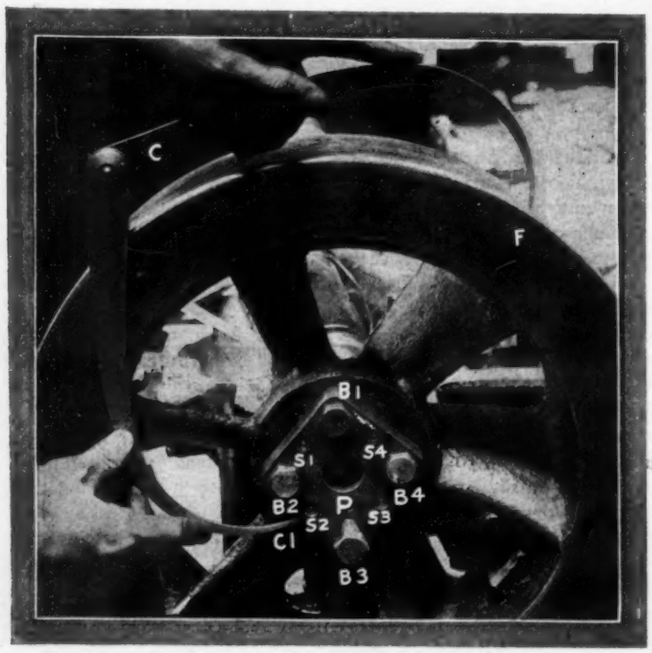


Fig. 1—Method of calibrating the part that has been attached by means of studs and bolts to the flywheel boss for concentricity

Fig. 2—Boss of the flywheel showing the studs that have been damaged through incompetent fitting

there will be undue wear on the universal joint and the disalignment may even cause a disagreeable knock at high speed. Incidentally, the part, although case-hardened, will wear and require replacement.

The case in point shows a Winton flywheel and the method employed in the shops and service departments of determining if the concentricity has been maintained in manufacture. Calipers are found useful in many ways on the car and in the garage of the private owner, as with this tool many small differences can be detected and wear located which otherwise could not be seen with the naked eye.

Shafts that are delivered by factories should have the centers left in them whenever possible, as it is difficult for the amateur

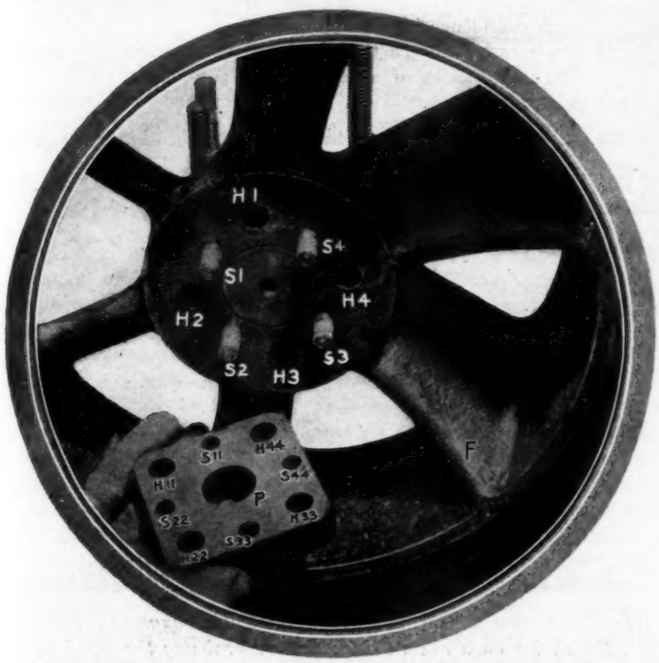


Fig. 3—Showing how the square block is attached to the flywheel and although it may fit on the studs properly, the outside squares may need dressing down

to recenter them. Fig. 2 is offered to show what might take place if the spare part were delivered with the holes badly drilled. If it were hammered on obliquely, as was the case in this particular instance, the studs will be burred, as may be seen at S4, and in a lesser degree at S3. Makers cannot be responsible for carelessness and want of experience on the part of operators of cars, and it is often better to let someone do the work properly in the first place rather than create work in undoing what has already been badly done.

Inaccessibility of Fans

UNLESS the method of drawing the air through the radiator to cool it is carried out by means of veins in the flywheel, the usual method employed is to drive a fan placed in front of the motor by means of a leather or metal belt. The disadvantage of the metal belt is that it is apt to snap, whereas the leather belt, be it either of the twisted-hide or the flat variety, as here illustrated, will in time expand and require taking up. This is effected by various means, but when it is a question of removing the belt to take out a portion owing to the stretch that has taken place, this part of the work very often entails a good deal of trouble.

The best form of belt is one that has been sewn previous to being used on the car, and the method seen in the illustration of dismantling the fan and its attachments greatly facilitates matters. The spindle S passes through the slot of the bracket B, and the bush R, which has a hole drilled eccentrically to ac-

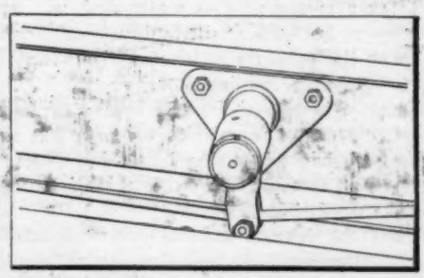
Method of attaching the fan to a bracket on the motor whereby ready dismantling is possible

commodate the spindle S, fits inside the bracket and is locked by a nut placed on the threaded end of the spindle. This operation, under the circumstances, should not take above a couple of minutes, and if the belt is not tightened after it has stretched the friction will wear the fabric quicker than if it was driving under tension.

More Attention Should Be Paid to Details

NOW that the automobile is attaining a certain degree of definite form as regards the motor transmission and rear axle, not that there are not many ways in which these can be improved upon, it is the part of a wise engineer to look into detail matters appertaining to the car. Each point that is added is a talking one for the salesman and redounds to the benefit and comfort of the user. The matter of brake compensation has been tackled in many ways, but quite a lot of the fittings are heavy and unnecessarily clumsy. Quite apart from this side of the question there comes the matter of appearance, which must be pleasing to the eye as well as useful and practical. The time is not far distant when the public will demand to see the naked chassis without body embellishments and judge for themselves whether the lubrication is properly taken care of, if the brakes are so made that adjustments can be well and speedily carried out, and in general look for refinements that will make the car easier to take care of. The sides of a car are often marred by the side rods that are used to operate the rear wheel brakes, and these come outside the valances that are used between the chassis frame and the running boards to exclude mud and dirt. The method shown in the illustration obviates this, as the brackets that carry the arms are inside the frame, and consequently out of sight.

The bracket is similar to the type usually fitted outside the chassis frame but is less likely to be clogged up with mud. The cross-shaft is not shown in the illustration.



Method of carrying the bracket for the brake levers inside the chassis frame

It Stands to Reason—

(Applying Reasoning Power to Difficult Situations)

In the face of a difficulty it may be the part of wisdom to resort to "presence of mind," or profit may come through the use of strategy—in either case the mind must be nimble, and to obtain this condition is a mere matter of practice.

THAT haste makes waste, excepting in the lubricating of an automobile, where no time is to be lost.

THAT the constituency of a chauffeur is made up of the mechanisms under his charge, and if he wishes to retain the good opinion of his constituency he must diligently court that opinion.

THAT the constituency of the owner of an automobile is made up of the car itself, the chauffeur, and the repair-man—it may be wisdom on the part of the owner to include his banker in the coterie.

THAT the fragmentary information that the average salesman imparts gratuitously to a prospective is scarcely sufficient to clinch an argument to the satisfaction of a conservative person.

THAT positive statements of alleged facts are the tools of those who are not on a speaking acquaintance with silent satisfaction.

THAT a beguiling automobile may have so many "selling points" that they will become troublesome to the owner.

THAT a shapely car when taken at its true estimate will have a certain harmony of relation of the mechanisms as well as appearance.

THAT a villainous automobile will not begin to make a noise until the maker gets his check.

THAT the man who can be lured by a decoy is pie in the hands of the glib-tongued agent who would foist a second-hand automobile in substitution of a new car.

THAT nothing defeats success like too much earnestness of purpose on the part of the buyer of a car in contact with the fellow who desires to get rid of a second-hand automobile.

THAT night time is the favorite for the delivery of a used automobile when it is being pawned off as a new car.

THAT the purchaser of a car will be justified in withholding payment for the same until he can look it over in broad daylight.

THAT the man who acts like a deity during the making of a sale has the devil for a wicked partner.

THAT the most pleasing thing to a cultivated taste is an automobile that lives up to the promise of a salesman.

THAT there is nothing to eclipse the reckless financiering of the man who uses tires that are too small for the car.

THAT a motor, if it is maltreated, will have ample opportunity to get back at the bully who abuses its sensibilities.

THAT the properly adorned body of an automobile is not necessarily red in color.

THAT it is easy to convict a man of imprudence if he buys a large tonneau if his neighbor has a large family.

THAT a man who has a liking for flattery may obtain the fullest measure by getting a car with more seats in it than he needs himself.

THAT the demerit existing in an automobile comes to the surface after the salesman gets through exploiting the merit.

THAT the fellow who toys with destiny to the extent of buying two bad automobiles in succession might well take himself to a dark room and study the situation over.

THAT the fellow who traded in one bad automobile for another, getting the latter from the same maker, displayed far too much confidence in humanity.

THAT adroitness on the part of a salesman may uncover a pious desire to dispose of a second-hand automobile.

THAT there are more mysteries in the world than those confined to chemistry, and a few of them are attached to the use of over-sized tires.

THAT over-sized tires should be used on all the cars of a given model if they are employed on the demonstrating car of the same model.

THAT a disinfectant will be scarcely sufficient to overcome the noise of an ill-contrived planetary gear.

THAT magnificent poetry after it leaves the hands of the demonstrator frequently displays an abnormal lust for noise.

THAT it would cost less money to overcome the troubles in a given model of a car than it does cost to keep these models sold.

THAT the man who takes an automobile back to have it "half-soled" might well make a bargain with the repair-man and have the stipulation put down in black and white.

Chains Require Attention

Of all the parts which suffer from neglect through inattention, the chains on a chain-driven car are probably the chief sufferers. There is no doubt that if the method of procedure in cleaning and oiling a chain were known, the proper attention might be given in a great many cases.

THE owner or driver of a chain-driven car should appreciate the fact that the chains need careful attention. While chains have been known to run an entire season without any care or additional lubrication, this practice is deprecated. To care for a chain properly, one should get into the habit of lubricating every so often and so time these intervals that they occur before the chain is in need of the oil. In addition to this regular lubrication, there should be some set time at the end of which the automobilist takes the chain off, cleans it thoroughly, and inspects it to detect faults.

A month is a good length of time for this, and an excellent way to proceed is to take the chain off and throw it into a pan of kerosene. In the morning, all of the dirt will have passed from the chain to the liquid and can be found in the bottom of the pan. Take the chain out and throw the liquid and dirt away. Then clean the pan and wash off all traces of the kerosene with gasoline. Having done this, hang the chain up to let the gasoline evaporate.

The chain then will be both clean and dry. Now inspect all rollers, links, rivets and bushings, taking note of any unusual wear as indicated by looseness or play. If defects are found, they should be remedied. Then, having the chain clean, dry, inspected and passed upon as O. K., an excellent method is to soak it, or, better, boil it in a heavy melted lubricant. The best quality of beef tallow mixed with a little graphite is good. Many do not like the latter, in which case a high-grade oil may be substituted for the purpose.

As to the Merits of Vanadium

Lake and Norris Vigorously Lock Horns

E. F. Lake discoursed under the caption "Alloy Steel for Automobiles" in THE AUTOMOBILE *of June 29, and George L. Norris expresses his disapproval of some of the doctrines indulged in by Lake in the article referred to, and the communication here presented gives Mr. Norris' version of the vanadium situation with which Mr. Lake generously disagrees.*

How Vanadium Looks Through the Eyes of George L. Norris

WE wish to take exception to some of the statements made in an article entitled "Alloy Steel for Automobiles," and published in your issue of June 29. From the introduction of this article we judged that it was intended to be an authoritative source of information for the automobile manufacturer and engineer.

The subject of the paper, "Alloy Steel," seems to have been carefully chosen, as the author eliminates from consideration practically all alloy steels excepting chrome-nickel. In the third paragraph of the article this statement appears: "The much-advertised vanadium steels have shown some good properties, but when submitted to various kinds of tests they have not taken the place of chrome-nickel steels." We expected to find in the later paragraphs some description of the qualities of vanadium steels, but were surprised to find the following: "Of the vanadium steels very little, if any, vanadium is present in the finished product and hence vanadium steel is a misnomer. Vanadium has great affinity for oxygen and also for nitrogen and if added to the bath just before teeming into the ladle it will seize these and carry them off into the slag. By thus scavenging out the oxides and occluded gases it retards the formation of blow-holes and the segregation of the carbides and makes the metal more homogeneous and also more easily machined. Aluminum performs a very similar mission, but yet we do not speak of aluminum steels."

While vanadium possesses a certain peculiar efficiency over silicon, aluminum and titanium as a scavenger it is not primarily used for this purpose, and the object of the steel maker is to alloy with the steel the highest possible percentage of the vanadium which he adds. The beneficial effects of percentages of vanadium varying from 1-10 of 1 per cent. up to 1 per cent. and even more have been definitely determined. Mr. Lake then continues: "Vanadium of itself adds no virtues to steel. When it has cleansed the steel of impurities it has performed its mission; thus it is as well to allow it to go off into the slag as to try to keep any in the steel, unless the steel maker wants to prove to the chemist that it is vanadium steel. That slags can be used in an electric furnace to perform the same mission of purifying the steel has been thoroughly demonstrated and this may overcome the necessity of using as expensive an alloying material as vanadium."

The experience of a large number of steel manufacturers who are producing vanadium steels regularly and the experience of the people who are using vanadium steels in automobile construction and a variety of other uses is overwhelmingly opposed to this statement and it should not have been at all difficult for Mr. Lake to have made himself familiar with the true ideas.

The steel maker before he makes a heat of vanadium steel has a fixed idea as to the percentage of vanadium he must obtain in the steel to produce certain results in the finished article. The steel that does not contain vanadium as shown by analysis is not a vanadium steel and will not exhibit the qualities, both static and dynamic, of vanadium steel. It is not a question of proving to the chemist that vanadium has been added; it is a question of having vanadium in the steel because by countless tests it has been proved that vanadium produces definite beneficial results.

The statement is made that vanadium steels have shown some good properties, but that when submitted to various kinds of tests they have not taken the place of chrome-nickel steel. Mr. Lake then proceeds to describe a chrome-nickel steel which he considers one of the best, but which is actually being looked upon with disfavor by many of the best automobile engineers and metallurgists because it is an unsafe steel. The legitimate field of Mr. Lake's chrome-nickel steel is for the manufacture of gears, and even in this field its supremacy has declined in favor of chrome vanadium steels. As for using this steel for front axles and steering knuckles we believe Mr. Lake's advice on this point is very unsound. It is true that vanadium steels, by which we mean various alloy steels containing vanadium as a component part, have replaced chrome-nickel and nickel steels to a very large extent in automobile parts. A great number of cars, including not only the low-priced machines but some of the highest-priced types, are made from steels containing vanadium. Against the opinion of Mr. Lake we quote from so well-known and universally recognized an authority as Prof. J. O. Arnold, of Sheffield, England: "Vanadium is undoubtedly the element which together with carbon acts with the greatest intensity in the way of improving alloys of iron, that is to say, in very small percentages." Professor Arnold is of the opinion that vanadium combines to form a double carbide of iron and vanadium, that it seems to have not only a chemical but a physical influence in promoting the even distribution of the carbon, and retarding constitutional segregation. He infers from this and other experimental evidence that there is strong reason to believe that very small percentages of vanadium will largely enable steel to resist the deterioration which under constant vibration leads to brittleness. This opinion of Professor Arnold's has been completely confirmed by the record of vanadium steels during the years that have lapsed since his statement, and they have well earned the name of "anti-fatigue steels." Mr. Lake's statement that slags can be used in the electric furnace to perform the same mission of purifying the steel as vanadium, and that this may overcome the necessity of using as expensive an alloying material as vanadium, can be answered most conclusively by the fact that manufacturers of electric furnace steel are to-day producing vanadium steels and making no pretense that they are able to produce steels of the same qualities without vanadium—the composition being otherwise the same. Vanadium so profoundly affects the physical qualities of the steels to which it is added, through its intensifying effect upon the other elements in the steel, carbon, chromium, nickel, silicon, etc., that these steels can properly be termed vanadium steels without misnomer.

To quote from Dr. John A. Mathews: "From a wide experience with all types of alloys, it is my opinion that where a better material than the best nickel steel is needed, and especially when dynamic excellence is sought, the appropriate types of vanadium-chrome steels may be unreservedly commended. They forge well and machine more readily than chrome-nickels of corresponding carbon percentages."

While nickel-chrome and nickel steels will undoubtedly always

continue to be made, they are being replaced by chrome-vanadium and chrome-nickel-vanadium steels on account of the superior static and dynamic qualities possessed by the vanadium steels.

The widespread use of vanadium steels in automobile construction for gears, rear axles, shafts, steering knuckles and levers, crankshafts, propeller shafts, valves, piston rods, springs, etc., is incontrovertible evidence that vanadium does add to the virtues of steel, for it is inconceivable that the manufacturers of automobiles would adopt vanadium steel to the great extent they have without familiarizing themselves with its qualities.

As a matter of curiosity I would like to have Mr. Lake explain how by the crucible steel process it is possible to reduce the sulphur and phosphorus to a greater extent than by the open-hearth process.

What E. F. Lake Thinks of the Norris Type of Criticism

IN an effort to critise my article Mr. George L. Norris starts off by saying it is worthless, without offering any kind of evidence, submitting a few facts, or giving data to prove his assertions, or show that misstatements have been made. Words have been multiplied, but in his whole criticism it is difficult to get hold of any facts or real data on which to base an argument. For instance, he takes exception to my statement that "Vanadium of itself adds no virtues to steel. When it has cleansed the steel it has performed its mission, etc." In trying to refute this statement he says, "The experience of a large number of steel manufacturers is overwhelmingly opposed to this statement—it is a question of having vanadium in the steel because by countless tests it has been proved that vanadium produces definite beneficial results." Absolutely no facts or data have been presented in confirmation or proof of this statement of his and yet he says there are countless tests. Why has he not submitted one of these?

A great deal of experimenting and testing has been carried on with vanadium-treated steels and practically all of these have shown that titanium has a great affinity for oxygen and to a considerably lesser degree for nitrogen. In the manufacture of high-grade steels, carbon, manganese and silicon are made to deoxidize the bath as much as is commercially practical. After this has been done the remaining oxygen and nitrogen can be further reduced if ferro-vanadium is properly added. In doing this most of the vanadium used goes off into the slag with these gases. Enough should be used, however, so as to leave about one-tenth of 1 per cent. of vanadium in the steel. The steelmaker will then be assured that it has thoroughly permeated the bath and seized all of the oxygen and nitrogen it is possible to bring it in contact with.

In this work it has performed a useful mission and nearly all the metallurgists who have investigated it have shown that its main mission is that of a scavenger. The literature of the American Vanadium Company has said this many times. While Mr. Norris has made statements, none of the investigators have submitted proofs that vanadium of itself adds any beneficial properties to steel. Professor J. O. Arnold, who is quoted by Mr. Norris, has not made any definite and positive statement to that effect. All of his statements are qualified with a word of doubt and thus show that until more complete data has been submitted he is not willing to make any positive statements. When Mr. Norris says, "It seems to have not only a chemical but a physical influence in promoting the even distribution of the carbon and retarding constitutional segregation," it does not necessarily mean what Mr. Norris wants it to mean.

By acting as a scavenger to remove the oxygen and nitrogen and thus prevent the formation of oxides and nitrides it would retard the segregation of the other elements in steel and cause a more even distribution of the carbon. It would also prevent the occlusion of gases to a large extent as well as the formation of phosphides and sulphides. In removing the above two gases it prevents other elements from forming combinations that are harmful to steel. It thus overcomes brittleness, refines the grain and makes the metal more homogeneous. This would cause it to have a greater resistance to rotary or vibrational strains, impact blows, or torsion as well as have higher static strengths.

The mere statement that a large number of steel manufacturers are producing vanadium steels regularly proves nothing except that they are supplying a demand.

Mr. Norris attempts an argument against my statement that various tests have shown that vanadium-treated steels cannot take the place of chrome-nickel steel. Again, however, absolutely no evidence, facts or data have been submitted. Countless tests have been made with vanadium-treated steels in comparison with other steels, but not one of these tests has shown us that vanadium treated steels equal either the static or dynamic properties of chrome-nickel steel; in most cases they could not nearly approach it.

The electric furnace for manufacturing steel is yet being experimented with in all kinds of ways. They are also producing all kinds of steel with them. Because some of these are vanadium-treated steels does not necessarily mean that the impurities removed by vanadium cannot be removed by using correct methods and slags in the electric furnace. If Mr. Norris had submitted any data to prove that vanadium-treated electric furnace steel is any better than electric furnace steels made without vanadium we might be inclined to listen and look for further data along this line.

As this argument is on vanadium, I will only say of the nickel-chrome steel that I called one of the best grades that it has been used by two engineers that I know of for the most vital parts of the automobile and gave better results than they obtained from other steel.

The widespread use of vanadium steels for numerous parts mentioned by Mr. Norris in his next to the last paragraph absolutely does not prove that "vanadium of itself adds any virtues to steel." It could just as readily prove that vanadium has fulfilled its mission when it has removed impurities and gone off into the slag, and thus strengthened and improved other properties of steel. Titanium, which in the ferro form is about one-twentieth of the cost of vanadium, has as great an affinity for oxygen and a greater affinity for nitrogen, it being the only undisputed example of the combustion of an element in nitrogen. This element will therefore give us practically the same results that are obtained with vanadium, and its growing competition may be the cause for the claims that vanadium of itself, in the proper percentages, adds to the static and dynamic properties of steels.

Neither in my original article nor in this answer to Mr. Norris have I said that vanadium did not produce beneficial results in iron or steel when properly alloyed and used in the correct percentages. The injurious effects of oxygen and nitrogen have been much more clearly brought to our attention since the advent of vanadium and much valuable data is thus at hand. That titanium or other elements still in the experimental stage or even the electric furnace will give us just as good results by removing the impurities is fast being demonstrated. As these are cheaper than vanadium they may take its place in steel making and leave to vanadium the medicinal mission claimed for it.

To satisfy Mr. Norris's curiosity, I will say that I do not think it possible to reduce sulphur and phosphorus by the crucible process to lower percentages than can be done in an open-hearth furnace. The possibilities of the open-hearth furnace are very great. By using the proper methods or slags it is possible to reduce sulphur and phosphorus to mere traces in an open-hearth furnace. This, however, costs money and makes the steel expensive. It is not possible to reduce these elements in the crucible, but the materials charged into the crucible must be such as will make their percentages low when the steel is poured into ingots. Ignoring possibilities, therefore, the probabilities are that when we buy commercial steels the crucible product will be lower in phosphorus and sulphur than the open-hearth product, as by charging the proper materials the phosphorus and sulphur are reduced to lower percentages in the crucible than in the open-hearth process.

Energy Diagrams and Efficiency

Showing How Available Energy Is Dissipated

Gasoline as it is poured into the tank of an automobile inherently contains a certain amount of energy and it is proposed in this article, that originally appeared in La Vie Automobile, to show how energy is lost through different channels before it arrives at the road wheels. It is suggested that makers should state the power of the motor as one unit and the power available at the road wheels as the other, thereby informing buyers as to what they are purchasing.

THE title of this article may appear complex to some, but in reality it is a simple question and, besides, is one that should interest the majority of car owners.

Every one knows what is meant by efficiency of a car; but as the word "efficiency" may have been used in other connections it is as well to be specific. If one were to put 10 liters (17.598 pints) of gasoline into the tank (weighing 0.7 kilogrammes to the liter) and possessing 10,000 calories (mean value), one would have for nourishment of the motor $10 \times 0.7 \times 10{,}000$ calories.*

It is possible to transform these calories into work in the form of kilogrammeters. (There are 7,233 foot-pounds in one kilogrammeter, one calorie equals 425 kilogrammeters, or 3,968 British thermal units, and one British thermal unit is equivalent to 778 foot-pounds.)

If the motor produces 75 kilogrammeters in one second it is said to have a power equivalent to one cheval-vapeur (which is equivalent to .9863 horsepower). To be exact, one horsepower is equivalent to 75.9 kilogrammeters per second.

With the 77,000 calories thus furnished to the motor we would be able to obtain, if the transformation was integral without loss, $77{,}000 \times 425$ kilogrammeters 32,725,000 kilogrammeters.

The ten liters of gasoline consumed in one hour would therefore give

$$\frac{32{,}725{,}000}{3{,}600 \times 75} = \text{cheval-vapeur.}$$

This is far from being correct because a 12-horsepower motor running at maximum power would not consume more than 10 liters per hour and (because it would be able to do at least 150 per hour) 6.6 per hundred kilometers. It is necessary to multiply by about 10 to approximate the actual consumption of such a car, as, for example, 66 liters. This consumption of 10 liters per hour and at full power corresponds rather to 12 horsepower than to 120 horsepower.

Therefore, instead of obtaining 121 horsepower at the road wheels at the point of contact with the road surface, this amount is nearer to 12 horsepower, *i. e.*, 10 per cent. That is to say, that a car that only gives 10 per cent. of the amount furnished is said to have a 10 per cent. efficiency. It is quite small, but, as is found out in practice, this is about the average. Certain cars could go as high as 15 per cent. (in which case they would have to furnish 18 horsepower), but this is a point rarely attained.

Where Does this Wasted Energy Go?

The motor for a start wastes a considerable amount. It only furnishes one-third of what one would be able to obtain on the crankshaft, as, for example, in the case of a dynamo. But in the transformation of energy from the clutch to the rims of the rear wheels there is a large proportion lost in transit. It is possible to measure these losses on the test bench by certain convenient apparatus. One can determine to which part to attribute the waste of energy—a liquidation so to speak—be it the motor, transmission, wheels or tires, and so on.

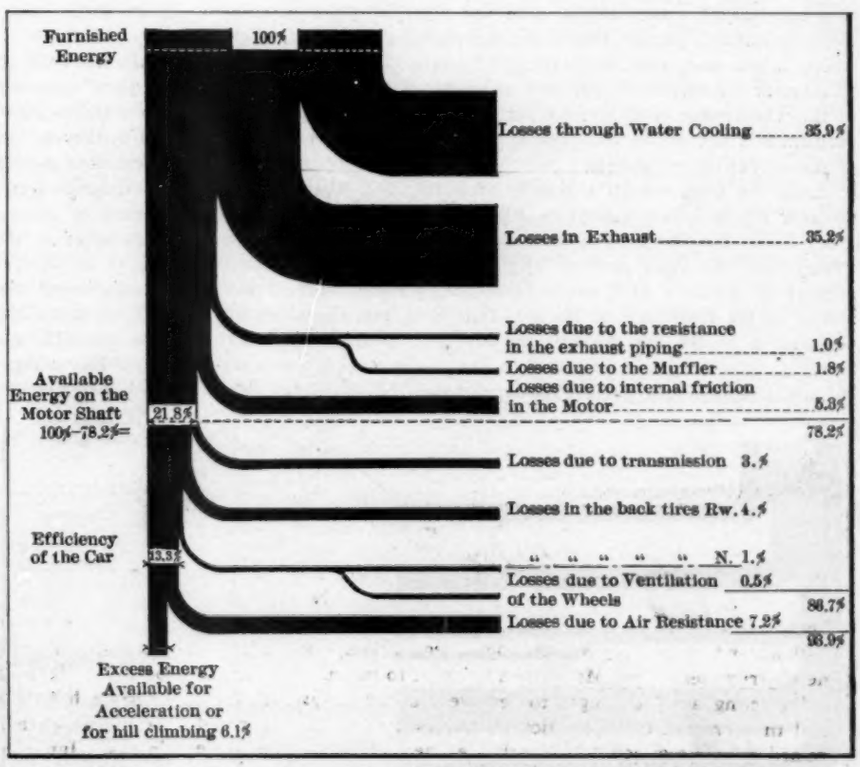

Furnished Energy
100%
Losses through Water Cooling 35.9%
Losses in Exhaust 35.2%
Losses due to the resistance in the exhaust piping 1.0%
Losses due to the Muffler 1.8%
Losses due to internal friction in the Motor 5.3%
78.2%
Available Energy on the Motor Shaft 100%-78.2%=
21.8%
Losses due to transmission 3.%
Losses in the back tires Rw. 4.%
" " " " " N. 1.%
Losses due to Ventilation of the Wheels 0.5%
Losses due to Air Resistance 7.2%
86.7%
98.9%
Efficiency of the Car
13.3%
Excess Energy Available for Acceleration or for hill climbing 6.1%

Fig. 1—Energy diagram of a 30-horsepower car running at 37 miles an hour (60 kilometers) on a level road, and the way the energy delivered by the gasoline is dissipated. The available energy at the crankshaft is only 21.8 per cent. of the total energy furnished. The motor and transmission comprising the wheels absorb 86.7 per cent. of the total energy, leaving 13.3 per cent. to combat the air resistance, grades and acceleration efforts; at 37 miles per hour 7.2 per cent. is absorbed in air resistance, leaving 6.1 per cent. for grade resistance. This surplus is totally absorbed on a grade of 6 per cent.

*Calories—Any of several heat units. The amount of heat required to raise the temperature of one gram of water one degree centigrade; called specifically small calorie. Since the specific heat of water varies slightly with the temperature, the rise of one degree is sometimes specified to be from 0 degree to 1 degree, or at or near 4 degrees (the temperature of the greatest density) or from 15 degrees to 16 degrees. In this last case the value of the unit is almost exacfly that of the mean calorie. The amount of heat required to raise one kilogram of water one degree centigrade. 1000 small calories, called specifically large or great calories. 1 calorie = 3,968 British thermal units. The amount of heat required to raise one gram of water from 0 degree to 100 degrees centigrade is known as centuple or rational calorie. One-hundredth of the centuple calorie is called mean calorie.

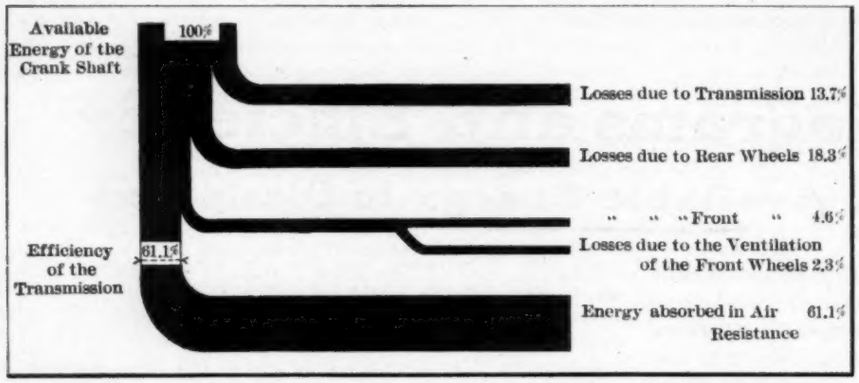

Available Energy of the Crank Shaft
100%
Losses due to Transmission 13.7%
Losses due to Rear Wheels 18.3%
" " "Front " 4.6%
Losses due to the Ventilation of the Front Wheels 2.3%
Efficiency of the Transmission
61.1%
Energy absorbed in Air Resistance 61.1%

Fig. 2—Energy diagram of a car taking into consideration the amount of energy available at the crankshaft. The motor is driving the car at 69 kilometers (43 miles) per hour. All surplus power is absorbed by wind resistance

These partial results can be calculated and expressed in energy diagrams. An energy diagram is one that appeals to the senses; they can be constructed in various methods. In Fig. 1 is shown a simple one.

As the term liquidation has been used above it will be as well to continue the simile, which is a convenient one, and let it represent the energy in a liquid form that would flow from the motor to the rear wheels. En route there are tributaries by which some part escapes.

Fig. 1 represents the diagram of energy of a car traveling at 60 kilometers per hour with the motor working at full power. Of the 100 per cent. of energy furnished 78.2 per cent. is lost in the water cooling, through the exhaust manifold and on account of the frictional losses in the motor.

All that is left of the total energy that will be available at the crankshaft will be 21.8 per cent. If one were able to utilize the available energy at this point the conditions would be ideal, but this energy must be transmitted to the driving wheels, and in this undertaking some more is lost, for example, 3 per cent. in the transmission proper (there are numerous channels through which it can flow, such as gearing, frictional losses, etc.). On arriving at the wheels 0.5 per cent. is taken off in the ventilation of the wheel; that is to say, 0.5 per cent. of the primary energy furnished is utilized in overcoming the work of the ventilation of the spokes of the wheels.

Lastly the tires absorb a goodly proportion of what is left, the rear wheel tires pre-empting 4 per cent. and the front tires 1 per cent. Finally there is left at the point of contact of the wheels and the road surface 13.3 per cent. of the primitive energy, of which a little more than half, 7.2 per cent., is absorbed by the resistance of the air—that is to say, the work of penetration of the car through the air—and there remains 6.1 per cent., which it is not proposed to use at the present moment, but which will permit us to slightly increase the speed (in this example to bring it up to 69 kilometers per hour) or to overcome the resistance of a slight gradient.

Division of Power

Taking up the example of the car consuming 10 liters of gasoline per hour, we have seen that if the 100 per cent. of energy thus furnished were delivered in the form of work we would be able to make use of fully 121 horsepower.

If the diagram of energy shown in Fig. 1 were applied to this motor the 121 horsepower would be split up in the following manner showing how the available power is absorbed at the various points.

Available power on the crankshaft.....	26.378	horsepower
Available power at the rims.....	15.093	"
Absorbed by air resistance.....	8.712	"
Available for acceleration and gradients....	7.381	"
The wheels and tires alone absorb.....rear	4.84	"
front	1.815	"

From this tabulation an idea of the efficiency of a car can be obtained. It is these two characteristics, viz., power available at the crankshaft and power available at the rear wheels that first started the use of appellations of car such as 10-14, 20-24, 15-20, 30-40 horsepower, etc. In the following example we will call this car a 15-25 horsepower, and this designation will be quite rational. The buyer who purchases a 15-25 horsepower car will know just what he is buying. But numerous abuses have robbed this designation of all value. One usually understands what is meant when a firm calls their car a 14-20 or a 30-40, but it is possible that some would not understand what was meant by 8-80 horsepower.

It would be very simple to approximately gauge the available power at the rim, which can be measured on a testing apparatus such as that used at the Automobile Club. As cars are for the most part constructed in series it would be sufficient if the maker were to submit one model of the series for a test which would neither be very costly or long and in this manner one of the vexatious questions would be settled.

The diagram has been plotted to show the commercial or normal speed of the car and not the maximum speed. This commercial speed is the one in which the efficiency of the car is found at its best. If the diagram had been plotted for the maximum speed we would have one similar to that shown in Fig. 2, in which the starting of 100 per cent. has been chosen as the available energy at the crankshaft and not furnished energy. Fig. 3 represents a diagram of a car climbing a grade at 60 kilometers per hour. The resistance of the air and the resistance due to the grade absorb practically all the energy available at the rim.

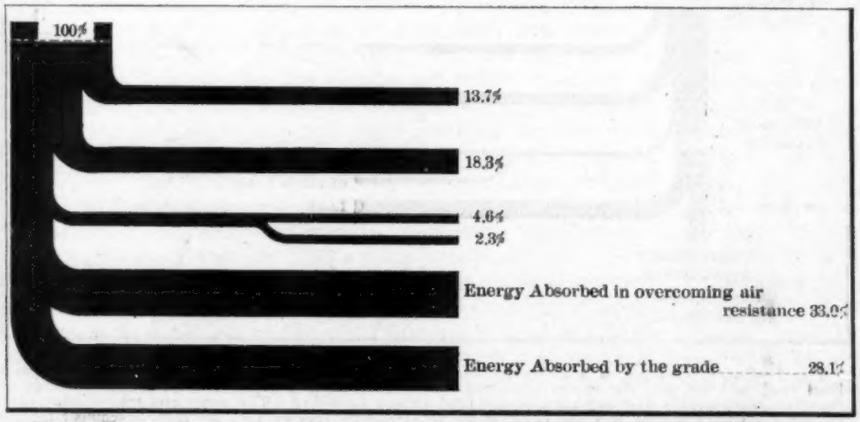


Fig. 3—Energy diagram of a 30-horsepower car running at 60 kilometers (37 miles) per hour, or on a grade of 6 per cent. (relating to the energy available at the crankshaft); 33 per cent. of this energy is absorbed in wind resistance and 28 per cent. by the resistance of the grade

These diagrams are interesting because they permit one to compare the different degrees of absorption and the quality of different cars. The point that is of interest to the purchaser and the maker alike is the amount of energy available at the rims of the wheels. When this characteristic is known it will be an easy matter to work out the ratio of gearing that would offer the best results. It is easy, as a matter of fact, to roughly approximate the energy that is absorbed by the air resistance at different speeds of running when the windage area is known. With these data to work upon one would know how much reserve power there is

available for accelerations of the car and grades on the different speeds.

If one wants a car that will climb hills easily even when heavily loaded, and without changing speed, a sufficient amount of reserve power must always be available. The more the reserve power one has the more pleasant it will be to drive the car, the quicker will be the starting qualities and the easier it will climb small hills.

On the contrary, if the excess power is small the driver will be forced to continually play with his levers and pedals. In the example chosen the car has a windage area of 2 square meters (21 square feet). If it were stripped for racing and the resistance were reduced to 1 square meter (10.764 square feet) the excess power would be much greater at 60 kilometers (37 miles) per hour—viz., 9.7 per cent. instead of 6.1 per cent, and with the same weight, 1.800 kilogrammes, the car would be able to climb a much stiffer hill.

How Steering Gears are Assembled and "Run In"

THE steering of some cars is particularly soft and easy of operation, which is due to proper balance and a good fit of all the parts, whereas the driving of another car, instead of being a pleasure, becomes a feat of muscular endurance. No doubt in time some of the stiffness will wear off, but high spots should be carefully removed before the car is handed over to the purchaser. The following method is the one employed in the Packard factory:

The throttle operating parts which are on the steering post are first assembled as a separate unit—the rod that goes inside the post, with the sleeve, collar and rocker arm at the lower end and the worm, throttle nut, lever, etc., at the upper end.

The steering worm and its shaft (which are one piece) are case-hardened and ground, then brazed into the post, and the bearing surfaces again ground. This and the steering wheel are the only composite parts that reach the assembling room out of the 184 different pieces that enter into the post construction.

A temporary steering wheel W is attached for "working in" the post, so that the permanent wheel may not be marred or soiled. The post is covered with a leather gaiter G for protection.

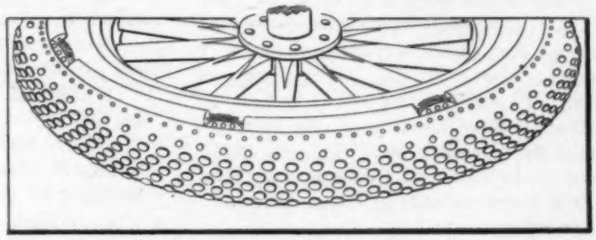
When the assembly is complete it is bolted to a solid rigging B on the floor, and first tested for any "play." Play cannot always be detected by manipulating the wheel with the socket in a vise. If play is detected, the post goes back to the bench and is readjusted.

With the post again bolted to the floor rigging, the sector lever A is attached by the steering connecting rod R to a hydraulic apparatus which imposes the same strains or conditions that are met with in road service with the car loaded. The expert takes it in hand, and by manipulating the different valves V in the test machine he gets the effect of driving over bumps and "thank-you-ma'ams" in a road, straight ahead and around the curves.

The steering-gear valve is operated by the backward and forward motion of the water pump and as the connecting rod R is attached by a ball socket to the piston rod, which latter is guided in the bearings B and B2, the steering is allowed to run itself in and thereby take off any high spots.

Center-Studded Detachable Non-Skid Treads

SUPPLEMENTAL treads on tires are now widely used, and there is more than one point to be said in favor of them; among others, that these treads offer the possibility of using a non-skid tread when it is deemed advisable to do so and which tread may be removed whenever the driver wishes. The protection afforded to the tire by the use of a well-fitting cover is a fact not to be decried, and it is generally in the small details that the various makes of detachable treads differ. In the selection of such treads, buyers lay most stress upon the possibility of quick adjustment and of maintaining tightness against the face of the outer tire shoe, which are indeed matters of considerable importance, especially the latter one; since the shoe will necessarily heat up if the outer tread slips on it, in which case the tire will suffer more than if it were running on the road itself.

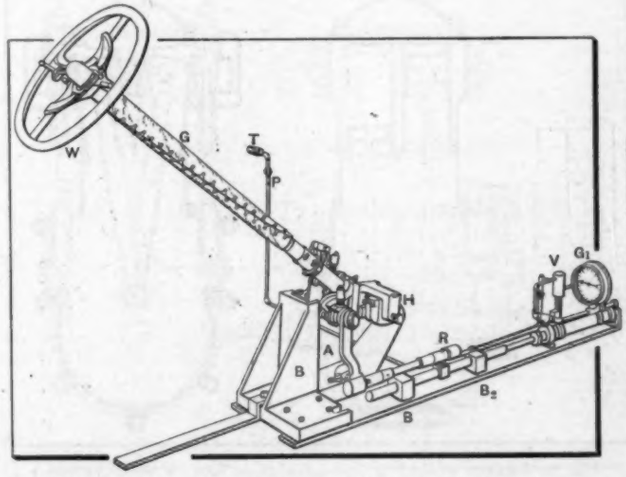


Illustrating the center-studded Woodworth tread

As an example of a non-skid detachable tread the Woodworth is shown in the illustration, it being the product of the Leather Tire Goods Company, of Niagara Falls, N. Y., and it will be well to call attention to the fact that the steel non-skid studs are only in the center portion of the tread, this being the part where it comes in contact with the road and which has to stand the continued working strain. The studs, as may be seen from the wax engraving, are set in several parallel rows, thus insuring prompt anti-skid action.

The illustration also shows the manner of fastening the tread to the tire. On both edges of the tread rings are provided which are composed of coil springs, of which there are six or eight. They are connected up by hooks and links in the manner seen in the cut, and a special tool is delivered to the buyer of every set, which permits of connecting up two springs by a single motion. This arrangement warrants tightness of the tread against the tire, and easy and rapid adjustment and detachment of the tread.

The center-studded tread has been designed with a special view to city work in which good roads only have to be encountered, generally speaking, in which cases, therefore, the protection of the central portions of the tire will fill all requirements. Owing to its character, the tread protects the tire against blowouts and punctures and, except when the car runs at very high speeds, the center-studded tread will be found very efficacious. In fact, if it is made to serve under the conditions it is intended for, it will be just as good as a full-studded tire, with the obvious advantages of less weight and price owing to its method of manufacture.



Showing the operation of running Packard steering gear

Wants Information About Strange Motor

Editor THE AUTOMOBILE:

[2,754]—The other day I was examining a motor which seemed to be of the two-cylinder type with the cylinders cast en bloc. I was under the impression that it was an extraordinarily large diametered motor and on inquiring found that it was a four-cylinder motor with the cylinders alongside of each other. Will you kindly show me by means of a diagram how these cylinders are placed? CHAS. STEVENS.

Davenport, Iowa.

The motor described by you is shown in section in Fig. 1. Referring to the cut, it is seen that the cylinders are inclined to form a V-shape with each pair of connecting rods working on the same crank. There are three flywheels within the motor which are connected to the cranks and crankshaft in the manner shown in the longitudinal section through the motor.

Desires to Paint His Own Automobile

Editor THE AUTOMOBILE:

[2,755]—I have a 1906 Model, 5-passenger touring car, with a white body. I wish to paint it black myself, with the running parts and wheels straw. Please give me directions or refer me to some firm who will furnish materials and directions. SUBSCRIBER.

Midnight, Miss.

If the surface of the car body is in good condition, that is, free from checks and fissures, it should be thoroughly sandpapered, after cleaning off all oil and grease spots, with No. 1 sandpaper, and coated solidly with a coat of ivory black, japan ground, and thinned to a brushing consistency with six parts turpentine and one of raw linseed oil. Let this coat dry overnight and then rub the surface down lightly with fine curled hair, which may be obtained from any local upholsterer or carriage trimmer. Then dust off and apply a second coat of ivory black thinned in eight parts of turpentine and one part of raw linseed oil. For applying this thin color use for a touring car surface a 2 1-2-inch camel's hair double thick brush. Put this second coat of color on, say in the morning, and during the afternoon apply a coat of black varnish color. This varnish color may be shop-mixed by first thinning with turpentine and then adding sufficient elastic rubbing varnish to produce a sharp luster. The proportions should be 1-4 pound of color to 2 1-2 pounds of varnish. Preferably, however, this varnish color may be bought in the form of black rubbing varnish direct from the manufacturer. Apply the varnish color with a half-elastic bristle brush, flat width 2 1-2 inches. Let this coat stand two days, whereupon rub lightly with a piece of broadcloth dipped in water and pulverized pumice stone. Wash and clean the surface thoroughly and apply a coat of elastic rubbing varnish, to which should be added a teaspoonful of ivory black to each pint of varnish.

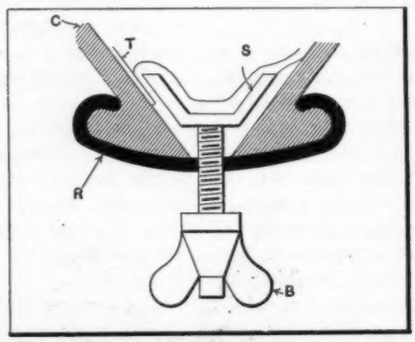


Fig. 2—Showing how tube is pinched by security bolt not brought properly into position. B, bolt; C, casing; T, tube; R, rim; S, security bolt

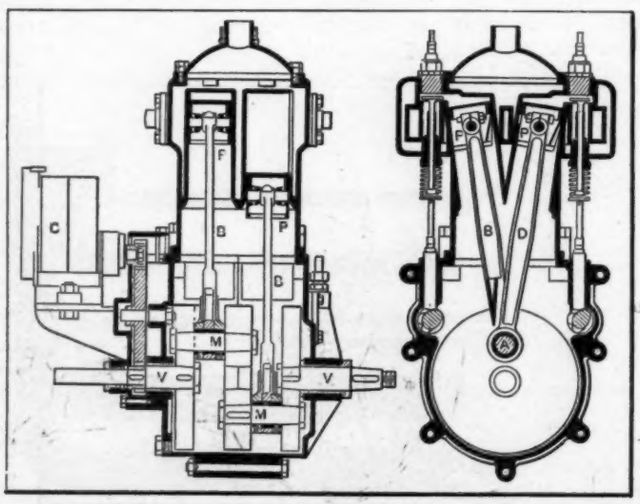


Fig. 1—Sections through a four-cylinder en bloc, V motor, showing a longitudinal and transverse section with the pistons, piston rods and three flywheels in their relative positions. P, piston; B, connecting rod; M, crank-pin; V, crank shaft; C, magneto; A, section of crank-pin

This black counteracts the discoloring properties of the varnish. Permit this coat to stand 4 or 5 days, the longer the better, then with a perforated piece of 1-2-inch felt dipped in water and then in the pulverized pumice stone rub the surface very thoroughly and uniformly, wash up and apply the necessary lines of striping. When these are dry, apply a coat of the clear elastic rubbing varnish, and after another four days rub with water and pumice stone, as above advised, wash up and finish with a high-grade finishing varnish. For a cheaper job omit one coat of the rubbing varnish and for a quicker schedule, use quick-drying rubbing varnish.

If the body surface is checked and fissured to a considerable extent sandpaper the surface after cleaning up, and apply a coat of lead-colored pigment darkened to a slate color and made of oil, ground white keg lead and lampblack, and containing enough oil after thinning with turpentine to bind the coat securely to the white foundation. Putty all defects in this surface very carefully, and proceed with the color coats as already detailed.

For the chassis or running parts, if the surface is in good condition the straw color may be applied directly upon the white, which color, by the way, makes an ideal background for straw. The straw color may be procured of any first class color grinder or it may be mixed in the shop of 5 parts of arctic or flake white, 2 parts lemon yellow and a drop or two of English vermilion. Use the japan ground yellow and white in making the straw color, and thin out with turpentine and raw linseed oil in the proportions advised for the color coats on the body. Apply two coats of the flat yellow on the chassis and then one coat of yellow varnish color, rub lightly on this coat with water and pulverized pumice stone, stripe in single, double or three lines as preferred, apply a coat of quick or medium-drying rubbing varnish and in due time rub down as before and finish with a good grade of chassis varnish. For a cheaper job omit the rubbing coat of varnish.

What Some Subscribers Want to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith.

To Prevent Tire Pinching

Editor THE AUTOMOBILE:

[2,756]—Having recently purchased a car and seeing that you are kind enough to give advice to beginners through the correspondence columns of your paper, I take the liberty of asking you to help me. I have mastered the mechanical parts of the car fairly well, but the tires cause me great anxiety. I do not drive fast, which I understand is the greatest source of tire

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith.

trouble, but the tubes get pinched and nipped and I would like to know the reason for this. I pay particular attention when fitting a new tube not to let the lever come into contact with it. I should be obliged if you would give me a suggestion as to how to overcome this trouble. READER.

New York City.

Your trouble may be caused either by the security belt or the bead on the casing. The tube T shown in Fig. 2 has been imprisoned by the security bolt S so that the latter cannot seat properly the bead. Or, when the car is turning a corner and the tire is not sufficiently inflated, the bead lifts from the rim R and pinches the tube T between the rim and the bead in the manner shown in Fig 3. Before attempting to replace the outer bead of the casing into the rim inflate the tube slightly and pass the hand inside the casing so as to be sure that the tube is not twisted or held under the security bolts. After the casing has been replaced the security bolts should be pushed up and down several times in order to make sure that they are free and seat properly.

Starting with a Broken Crank

Editor THE AUTOMOBILE:

[2,757]—Would you kindly inform me through your columns of a method of starting a motor which has a broken crank. The crank is broken in such a way that it is impossible to use it and the machine was towed to a repairman. I would like to know if it would have been possible to start the engine without the crank? A. P. V.

Albany, N. Y.

If the flywheel is accessible it may be turned over and the engine started. When doing this it is well to prime the cylinders through the pet-cocks. A rear wheel may be jacked up and turned over in a forward direction with the high gear thrown in. Still another way is to let the car run down hill or get some one to push it with the clutch disengaged until it gains momentum, the clutch is then thrown in. When the explosion occurs the clutch is disengaged until the motor gains speed.

Interested In Sleeve-Valve Motors

Editor THE AUTOMOBILE:

[2,758]—I take the liberty of asking a question and would be pleased if you will give me a reply at an early date through the columns of your paper. On page 1056 of the issue of your magazine for December 22, 1910, you describe the Henriod four-cylinder rotary valve motor. Will you please explain by a sectional view of this motor the operation of the rotary valve, and also the auxiliary piston in the Berliet motor referred to in the next paragraph.

Detroit, Mich. K. C. W.

The Henriod type of rotary valve is illustrated and described in another portion of this issue, and the Berliet auxiliary piston will be described at a later date in the near future.

Wants Information on Marine Motor Design

Editor THE AUTOMOBILE:

[2,759]—Will you kindly give me the following information through your columns:

1. What should be the relative volume of the compression space in a 10 x 10-inch gasoline motor for best and most economical working; or, in other words, what percentage of the volume should be left when the piston is at the highest point of the stroke?

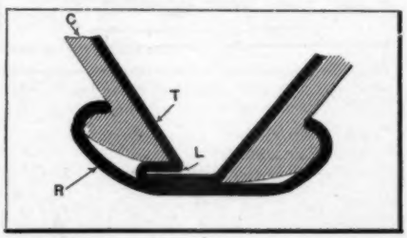


Fig. 3—Showing soft tire pinched by casing. C, casing; T, tube; R, rim; L, lap

2. I have an 8-cylinder 10 x 10-in. motor on a launch and am greatly troubled by premature firing. I believe high compression to be the cause. Do you think so?

3. What should be the length of stroke of a low-speed marine motor of this bore according to modern ideas? C. MORRIS.

St. Louis, Mo.

1. For a compression of about 65 pounds, the total volume of the cylinder would be about 3 1-2 times the clearance volume.

2. High compression is one of the causes of pre-ignition, but it is infrequent in a well-designed motor. For a slow-speed marine motor a compression of 65 pounds would be ample. To determine the amount of compression the spark plug should be removed and a bushing inserted; a pressure gauge can then be attached. The engine may then be turned up against compression and readings taken on the gauge.

3. A very flexible motor for marine work would be given by having a bore of 10 inches and a stroke of 13 inches.

Compressing Spring on Clutch

Editor THE AUTOMOBILE:

[2,760]—I have removed the clutch from my machine and find that I cannot compress the spring. I would like to know of a method of compressing the spring, perhaps by means of some simple fitting which I will be able to attach myself, and if you could give me any advice on the same in your columns I am sure it would be of general interest. SUBSCRIBER.

Grand Rapids, Mich.

A simple attachment which can be made in any shop, or by a blacksmith, is shown in Fig. 4. Around the collar of the clutch is placed a split clamp held together by two cross bolts. Passing through this clamp are two bolts about 3-8 of an inch in diameter sufficiently long so that the cross piece which is seen in the illustration touching the clutch spring, and which has two holes drilled in it, can pass over the bolts and allow sufficient room on the threads to start the nuts. With the aid of a wrench, the nuts can be alternately tightened until the spigot shaft passes sufficiently far outside the spring to permit the adjusting collar and nut to be screwed thereon.

The cross piece has to be drilled so that the shaft will pass through easily and sufficient to allow the nut to pass.

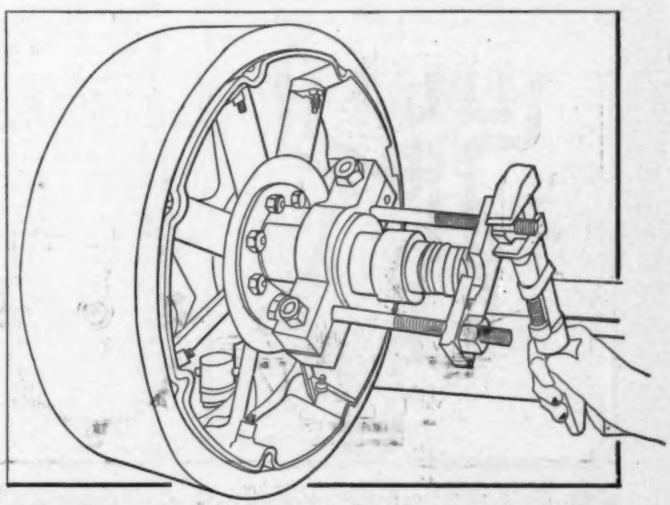


Fig. 4—Showing the method and tools used in compressing the clutch spring

Meeting Recurring Troubles

Presenting a Series of the Most Probable Cases

A series of correlated short stories, accompanied by diagrams and characteristic illustrations, including the nature of the troubles that are most likely to happen to automobiles, discussing their causes and effects, all for the purpose of arriving at a remedy. It is the aim for the most part to show how these troubles may be permanently remedied, and as a secondary enterprise it is indicated how the automobilist can make a temporary repair, thereby enabling him to defer the making of a permanent repair until a convenient time arrives.

AUTOMATIC LUBRICATION ON THE PANHARD & LEVASSOR.—The lubrication of the Panhard & Levassor twenty-horsepower valveless motor is done by means of both pump and splash. The oil is contained in the crankcase, which has a capacity of about 2 quarts when the oil is up to its proper working level. The oil is supplied to the crankcase by means of the breather pipes, which are equipped with strainers to insure a clean supply of oil to the crankcase.

The pump, which is driven off the camshaft, is of the plunger type and has a variable speed, which is entirely dependent upon the speed of the motor. The quantity of oil delivered, however, may be regulated by adjusting the length of the stroke of the pump plunger. The pump lifts the oil from the crankcase and forces it up through a sightfeed, which is located on the dash. After passing through the sightfeed the oil flows down into the splash troughs, which are located under each cylinder. In passing to these troughs the oil is led through the main bearings of the crankshaft and in this manner their lubrication is made positive. Another means of adjusting the quantity of oil supplied to the motor is furnished in the sightfeed itself, as the quantity of oil which passes through it may be governed and the excess will pass through a by-pass and back into the oil tank under the foot boards of the motor. The oil tank is connected directly to the pump by means of the suction pipe through which the oil is drawn on the first stroke of the pump. On the second stroke of the compound pump the oil is sent to the sightfeed.

After having passed into the splash troughs the oil will be picked up by the connecting rods and dashed into a spray. In case an excess of oil collects in the crankcase due to too much having been admitted from the sightfeeds it will be necessary to drain the excess from the base of the motor. For this purpose a drain, which may be opened by pulling a wire on the dash, has been installed. It is thus possible for a driver to drain the excess oil from the crankcase without leaving his seat.

There is a lead into the gear box which takes care of this part of the mechanism, while the transmission and differentials are taken care of independently by being packed in oil and grease.

LUBRICATION OF THE 25-H.P. PAIGE-DETROIT.—The Paige-Detroit car is lubricated by a simple splash system. The lower half of the crankcase is divided into two parts, the lower part forming the oil reservoir, while the upper carries the oil being used for the splash system.

The upper division of the oil pan casting is moulded so as to contain a series of troughs, one below each cylinder. These troughs are deep enough to hold the oil into which the connecting rods dip at each revolution.

The oil is drawn from the lowest part of the crankcase by a plunger pump and forced through a sight-feed located on the dash. It then flows by gravity into the foremost splash chamber, drains over this into the next, and so to the last. When the oil level in the rear splash chamber becomes so high that it overflows the walls it passes down into the reservoir again. Then the oil is strained and passes again through the pump, which is driven off the camshaft.

The connecting rods dip into the troughs with such momentum that the oil is thrown in a spray up into the cylinders, lubricating their walls, as well as the connecting rod bearings and camshaft.

There are drain plugs in the bottom of the crankcase through which the oil may be drained out.

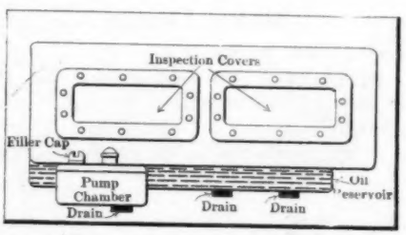


Fig. 2—Paige-Detroit crankcase, showing inspection covers on side of crankcase and location of oil reservoir

THE MARION "40" LUBRICATION SYSTEM.—The Marion 40-horsepower car is lubricated by a combination of the force-feed and the splash systems. The oil is forced by means of a pump to the main bearings. After passing through the main bearings and lubricating them, the oil drains down into the splash troughs, which are located in the crankcase in such a position that the connecting rods splash into the oil contained in them for a depth of about one-eighth of an inch.

The pump is located on the left-hand side of the motor. It is of the gear type and is driven off the camshaft. The pump draws its supply of oil from the crankcase reservoir, or, in case the oil level in this reservoir has fallen below the required amount, oil may be pumped to the pump chamber by means of a hand plunger pump which is located on the board just below the driver's seat.

The hand plunger pump draws the oil from an auxiliary tank in the rear of the car and forces it into the crankcase just under the pump chamber.

When about to start on a run the reservoir should always be filled to a fair level, the amount necessary, of course, depending on the length of the trip. The level of the oil in the crankcase reservoir may be observed by means of a gauge glass, which is set between the two middle cylinders on the top of the crankcase. The oil level should never be allowed to sink out of sight in this glass.

When the oil tank requires filling the top of the breather tube is removed and the oil poured through the screened opening in the pipe. It is a good plan to clean the screen immediately after the oil has been poured into the tank.

The entire interior of the motor is oiled by the oil mist which is present in the crankcase due to the splash of the rapidly revolving cranks into the oil in the crankcase partitions. This oil will flow back to a certain extent into the reservoir from where it is again passed through the system. Besides the cylinder walls, connecting rod bearings, etc., the camshaft, timing gears and water pump shaft are also lubricated by the splash.

There are grease cups located at various parts of the car. The differentials are packed in light grease, as are also the transmission and wheel bearing casings.

COMBINATION SYSTEM OF THE MARION "30".—The crankcase of the Marion "30" is divided into four sections, which form the splash troughs for the auxiliary oiling system. The main oiling system is a mechanical force-feed arrangement which is located at the highest part of the engine on the rear end. The mechanical oiler box is filled through a filler opening in the front end of the box by removing a cap. There is a gauze screen in the opening through which the oil is poured into the box. Before filling the tank the screen should always be taken out and cleaned with a little gasolene.

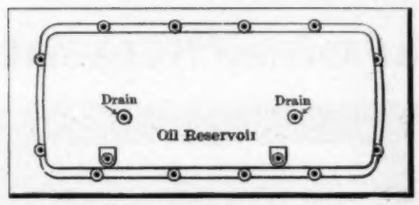


Fig. 3—Illustrating oil pan of the Marion "30," with drain plug and bolt holes shown

Besides the oil carried in the force-feed box there is a supply carried in the splash troughs in the crankcase. This part of the crankcase should be filled to the level of the top of the trough walls before starting on a trip, so that the cylinders will be lubricated by the splash as well as by the force-feed system.

The force-feed system is operated by an eccentric off the flywheel shaft. An eccentric rod runs from the eccentric up to a crank on the side of the oiler box nearest the dash. This crank drives a shaft which runs through the mechanical oiler and rests on a journal on the forward end of the box. There are three cams located on this shaft, each cam driving two oil pumps of the plunger type. The cams lift the pump plungers and allow them to fall suddenly over an edge of the cam. A spring attachment causes them to snap down; thus sending the oil, under pressure, down the six leads which are located beneath the box. Since there is a separate pump for each lead the amount of oil pasing through each may be regulated according to the needs of the spot to which the oil is led. This regulation is affected by means of adjustment screws on top of the box.

There are three main bearings, but only one of them is supplied by oil from the mechanical oiler; this being the one nearest the flywheel. The others are oiled by means of the splash system. Four of the leads from the oiler box run respectively to the walls of each cylinder, and the remaining lead runs into the timing gear case.

The excess oil from all the bearings supplied by the force-feed system drains into the crankcase. In this manner the troughs are kept constantly full.

The connecting rods dip into the oil for a distance of about one-eighth of an inch and churn the oil in the crankcase up into a fine vapor.

CIRCULATING SCHEME OF THOMAS CARS.—The Thomas cars are lubricated by means of a circulating system which takes the oil from the reservoir and sends it through the oiling system. After use the oil is strained and used over again.

The reservoir is located in the crankcase and holds about two gallons of oil. The crankcase is arranged so as to have an inner and an outer bottom. In the outer or lower bottom the oil is carried, while the inner bottom is divided by partitions so that a trough is formed below each cylinder. There are three standpipes of elliptical section, so placed that in case the oil rises high enough to overflow the trough walls it will drain into these standpipes and by means of them into the oil reservoir below. The function of the troughs is to hold a sufficient supply of oil for the connecting rod caps to dip therein and churn the oil up into a vapor.

The pump which actuates the circulating system is of the plunger type. It takes the oil from the lower part of the crankcase and sends it through a three-glass sight feed and the three leads to the main bearings. The sight feed is located on the dash, and by its aid an accurate account of all the oil passing through the system may be had as well as a knowledge of the condition of the pump. The pump is driven off the cam shaft by means of a vertical shaft, spiral gears and an eccentric. It is contained in a brass casing which is held to the bottom of the motor base by cap screws.

After lubricating the main bearings the oil finds its way down into the splash troughs, from which it is picked up by the connecting rods and carried

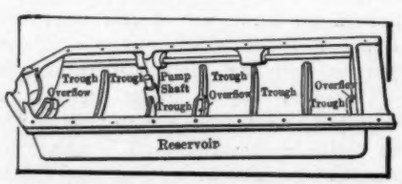


Fig. 4—Lower half of Thomas crankcase casting, illustrating disposal of splash troughs and overflow holes

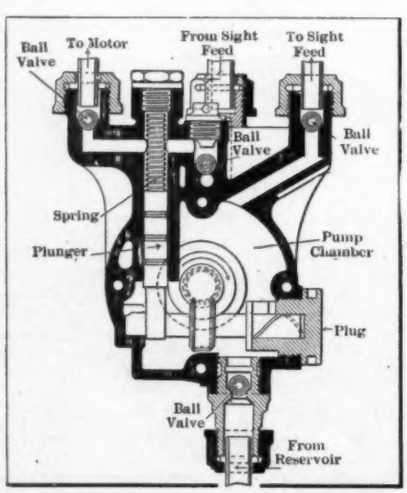


Fig. 1—Oil pump on Panhard & Levassor 20-horsepower valveless motor, showing leads, ball checks and plunger

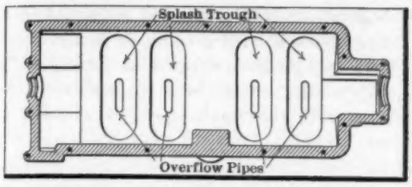


Fig. 5—Oil pan casting of Marion "40," showing overflow standpipes and oil troughs

to the other bearings. The oil through the standpipes drains back into the reservoir, but before entering into the suction end of the pump again, it passes through a strainer.

The reservoir is filled through the breather provided with a screen. The amount of oil present in the reservoir may be determined at any time by two try cocks provided for the purpose. The upper one is opened when filling the reservoir and oil is poured in until there is a flow of oil from it. The oil should never be allowed to run below the lower one. If it should reach the level of the lower try cock there is still enough oil in the tank for a run of about fifty miles, which will generally be enough to take the car to a place where more oil can be procured. The upper try cock is stamped FULL while the lower is stamped SAFETY.

The oil in this system should be thoroughly drained out about once a month and the crankcase flushed out with kerosene. To loosen carbon deposit the crankcase may be filled to the working level with kerosene and the motor run for about a minute in this condition. The other bearings throughout the car are taken care of by grease cups and oilers, while the differentials and transmission run in oil and grease.

MECHANICAL OILER ON THE STEVENS-DURYEA.—Stevens-Duryea cars are equipped with a mechanical oiler placed on the right-hand side of the crankcase at about the longitudinal center of the motor. This mechanical oiler carries the oil supply as well as a set of pumps which actuate the force feed. The mechanical oiler box has a capacity of five quarts and may be refilled by lifting the right-hand part of the engine hood and unscrewing the cap over the filler hole, which is on the front end of the box. When the cap is removed a screen is exposed through which the oil is poured, thus removing any foreign matter present in the oil.

Within the mechanical oiler box, which is placed so that the heat of the exhaust keeps the oil in a state of uniform temperature and consistency, there is a mechanically operated independent pump for each one of the leads through which the oil is forced to the main bearings. The pumps are driven from the layshaft by means of gears which drive a shaft in the oiler box. The small plunger pumps are driven in turn from this shaft, and the stroke of their plungers may be regulated anywhere from 0 to a full stroke. In order to determine exactly how much oil is being delivered from each pump it is only necessary to press down upon the bleeder valve caps while the engine is running. Oil will then drop from the bleeder valve nozzle into the tank instead of through the lead to the main bearings as it will do when the pressure is relieved. The plungers should be adjusted so as to give about two drops on each downward stroke, although when the car is new a little more oil may be of advantage until the bearings are worn to a smooth fit.

After the oil is forced by the plunger pumps to the main bearings it will lubricate them and drain into the crankcase, which is divided so as to have a compartment below each cylinder. A pool of oil will be formed in the compartment into which the connecting rod will dip at each revolution, thereby lubricating the moving parts in the entire crankcase.

Within each crankcase compartment there is a standpipe 1 1-8 inches in height. The oil should never be allowed to be above the level of the top of these standpipes, for then the motor will commence to smoke; for this reason the pumps in the mechanical oiler should be so adjusted that they do not give too much oil. At the bottom of each standpipe there is a cock which may be opened to let the oil flow out should it have accumulated to a height which is above the level of the top of the standpipe. If oil does not flow, however, it is not by any means a danger sign, as the motor will be amply lubricated if the pumps are each feeding two drops of oil on each downward stroke. Oil may be supplied directly to the crankcase if necessary through the breather pipes. There are three of these, one to each pair of cylinders. They are equipped with screens.

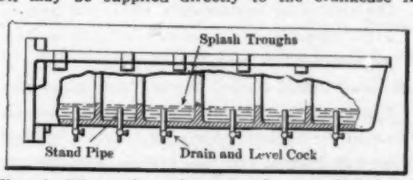


Fig. 6—Illustrating oil reservoir and drain and level cocks on Stevens-Duryea crankcase

About once a month the crankcase should be cleaned out with kerosene. This can be done by removing the petcocks under the base of the motor and filling to the usual level with kerosene oil. The motor is then started and allowed to run for about a half minute. The petcocks are then removed together with the drain plugs and the kerosene allowed to drain out. The plugs and cocks are then replaced, the latter being left open and oil is poured through the breathers until it starts to flow from the petcocks. The cocks are then shut off by turning the handles up.

The transmission case may be treated in the same manner, except that it is filled with about two quarts of heavy black cylinder oil.

CIRCULATING SCHEME ON THE ROYAL TOURIST—The circulating system which is employed on the Royal Tourist motor is operated by means of a gear pump which is located in the reservoir which carries the oil supply. This reservoir is in the base of the motor and has a capacity of about two and one-half gallons. The pump is of the gear type and is driven off the camshaft. It takes the oil from the base of the motor and forces it up through a filter located on the side of the motor and easily accessible, so that the screens may be taken out and cleaned from time to time. The oil in the filter, which acts at the same time as a distributor, is under a pressure of about two pounds. The pressure in the filter and distributor may be easily determined by means of a pressure gauge which is located on the dash. Special care has been taken to perfect this filter, and it is constructed so as to be composed of alternate layers of filter paper and metal disks.

There are two leads from the filter, one of which passes directly to the timing gear case, and the other passes up to a sight feed, at which point the oil is divided into three parts and passes through three separate sight glasses. Each of these sight glasses leads directly into a lead to a main bearing. The main bearings are lubricated by the oil which passes through these leads, the oil then draining down into the splash troughs which are placed so that there is a trough below each cylinder.

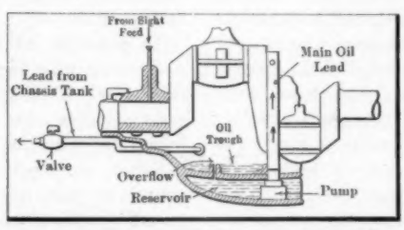


Fig. 7—Showing circulating system on Royal Tourist motor and the lead from auxiliary chassis tank

The oil drains from the main bearings at a rate which is rapid enough to keep the troughs constantly full and overflowing. The overflow of the splash troughs is taken care of by a series of standpipes which are placed one in each trough. These standpipes are of such a height that when the oil reaches the top it is of just such a height that the connecting rods will dip to a proper depth into the oil contained therein. The rapidly revolving connecting rods churn the oil into a mist which entirely pervades the crankcase and lubricates all the moving parts which are located within the confines of this casting.

To make the lubrication more certain there is an oil catch on the crank cheek which catches the oil and by centrifugal force sends it through a lead drilled in the crankshaft up into the crank pin. The bearing at the crank-pin end of the connecting rod will be lubricated by the oil which flows through the duct in the pin, and in addition the oil is sent up along the connecting rod through a small tube to the wrist pin. With this system there is a forced feed to the three crankshaft bearings and to the bearings at the ends of the connecting rods.

Should the pressure at any time mount too high there is a safety valve controlled by a spring which allows the oil to by-pass into the timing gear case. The supply of oil through the main leads may be governed by means of this safety valve. To increase the supply of oil delivered to the main bearings, the nut which controlls the tension on the spring which holds the ball check in the safety valve is given a turn or two to the left, thus releasing the tension on the spring. To decrease the supply of oil the procedure is, of course, directly opposite.

Besides the supply of oil which is carried in the crankcase there is an auxiliary supply carried in a three-gallon chassis tank located under the floor boards. Between the tank and the lower part of the crankcase into which the pipe from the tank is led a valve is inserted so that the supply of oil in the crankcase may be augmented at will.

The other bearings on the car are taken care of in the usual manner by means of grease cups, while the transmission and differentials are packed in oil and grease.

ADJUSTABLE TROUGHS ON THE DAIMLER.—The Daimler cars are lubricated by the splash system. The oil reservoir, which has a capacity of about two gallons, is located in the lower part of the crankcase. The crankcase casting is in the form of a basin with an inner and an outer bottom. In the lower or outer bottom the oil supply is carried, while the inner bottom, which in this car is not an integral part of the crankcase casting, is an adjustable tray capable of a perpendicular motion. Upon this inner bottom or tray rest the splash troughs into which the oil flows while the lubricating system is in operation.

The oil starts originally from the bottom part of the crankcase in which the whole available supply of oil is carried, and passes up into the line of splash troughs and then overflows back to the reservoir in the bottom. This process of circulation requires of necessity some outside force to carry the oil through the system, and this is furnished by means of an oil pump. This pump is of the plunger type and is driven off the camshaft by means of an eccentric and rod, which extends vertically down into the base of the motor on the right-hand side, being enclosed, however, by the crankcase so that it is in itself lubricated by the splash of the connecting rods into the above-mentioned troughs.

The pump lifts the oil from the crankcase reservoir and forces it into the main oil lead, which is a pipe running around the inside of the crankcase. This pipe is perforated at the forward end of the crankcase so that it permits the oil to drop into the foremost trough. The oil is constantly being fed from the pump, so that it will soon overflow the first trough and find its way back until all the four troughs are completely filled and overflowing.

The connecting rods dip down into the oil and beat it into a mist which is present in all parts of the crankcase in sufficient quantities to lubricate all the moving parts therein. This includes the pistons, connecting rod bearings, camshaft bearings and the pump eccentric rods as well as all the crankshaft bearings. The pump, since it is operated from the camshaft, will bear a relative speed to the motor itself, that is, the greater the number of revolutions per minute made by the motor the greater the number of strokes per minute made by the pump plunger. This takes care of the speed of the car, but does not automatically take cognizance of the heavy duties laid upon the motor in moving slowly up a steep hill. To take care of this an arrangement is made whereby the connecting rods dip more deeply into the splash troughs and hence throw more oil up into the heated cylinders. A motor will have great tendency to heat up in running up a hill owing to the open throttle and late spark. In this way the mixture is not only rich, but the late spark tends also to overheat the motor. A rod, which runs longitudinally within the crankcase, is jointed to the tray which carries the splash troughs, so that when it is turned by means of the regulating levers the tray is lifted and in this manner the connecting rods are bound to get more oil. Besides acting as a lubricant, when the oil is copiously supplied, as it will be when adjusted in this manner, it also acts as a liberal cooling agent.

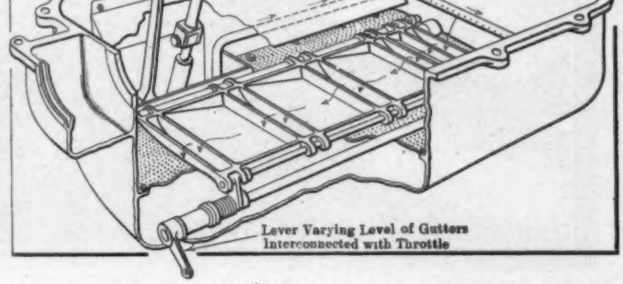

Plunger Pump Worked from Eccentric Shaft
Pump Valve Rod
Oil Feed Pipe from Pump
Baffle Plates
Lever Varying Level of Gutters Interconnected with Throttle

Fig. 8—Sectional view of adjustable splash gutters in use on English Daimler cars. The pump rods and eccentric are also shown

Making Wooden Chassis Frames

The making of the wood sill is an important operation in the plant of the H. H. Franklin Manufacturing Company, which features this form of construction, having used and developed it from the time it first began to build its air-cooled cars thirteen years ago.

Fig. 3—Screwing the laminations of the sill together

THE study of wood for the manufacture of sills and the results obtained have not attracted the widest attention in the automobile world, due to the fact that the majority of cars are built with steel rather than wood and that there are few wood chassis frames outside the line of the H. H. Franklin Mfg. Co.

The course of a piece of timber which is designed to become a part of one of these sills is hedged about with as much watchfulness as is that of a piece of high-grade steel. From the very beginning the wood is carefully chosen. It is all ash of second growth.

This is selected because it is of better grain than first growth and is more adapted to the service requiring strength, resiliency and lightness. Most of that used at present is taken from northern Pennsylvania. Southern ash is too brash. The stock is carefully selected. The second-growth ash used is about 16 feet long and is 1-inch stock.

After being shipped to the factory it is stored in a yard to season for two years after which time it is ready to be used.

When it has been thoroughly weather seasoned it is taken to the sawmill and, after being marked with a form, is sawed up into sill-shaped pieces. These are given a short kiln drying to increase their resiliency and render them less susceptible to weather conditions. From the kiln the pieces go to the wood shop where they are planed.

This operation is shown in Fig. 7.

Some are planed thinner than others, and the next move consists in sorting out two thick sections and one thin section, the latter being the middle ply of the three-lamination sill. The outer layers are left thicker at this point as yet more planing and trimming which in the end leaves the three laminations the same thickness. These three sections are painted with glue and are fastened together with clamps applied in close proximity to each other, the whole operation being clearly indicated in Fig. 2.

The gluing is generally done late in the afternoon, and the clamps are allowed to remain in position until the following morning, causing the glue to "set." Then after more jointing and planing the sill is marked, band-sawed and shaped on a former. This leaves it the size desired for use.

Being made of three layers of wood, precaution is taken lest water or the weather affect the serviceability of the pieces by working into the glued joints at the top and bottom. Along the top and bottom of each sill is fastened a strip of ash 3-16 of an inch thick. The three laminations are next fastened together with screws, making the three-ply sill stronger than it would be were it a whole piece of the same size. The thickness of the completed sill is 1 3-4 inches. The screwing operation is shown in Fig. 3.

To provide for the rear cross bar, the sills are put through a forming machine which cuts a right angle section from the rear end of each, permitting the insertion of the cross bar ends. Holes are next bored for the emergency brake band lever, and then the sill goes to its assembly.

Bench workmen, who perform this task, clean the sill and round up the top and bottom edges. The top corners are rounded with a radius of approximately 1-16 of an inch while the bottom corners are rounded with a radius of 1-8 of an inch. This is because the larger radius is more serviceable in its position while the 1-16 of an inch radius is more pleasing to the eye.

The front end of each sill is covered with an aluminum cap. The rear corners are strengthened by a block 4 x 4 x 4 1-2 inches, glued and screwed inside the angle.

In assembling the forms the work is carried on a "trestle." The floor boards, very small iron attachments, etc., are put in place here.

Workmen are not troubled with measuring for the location of holes, all this being done with a templet. In boring, certain positions of the frame on the "trestle" give the correct angle for the holes. The glue used in this work is an imported French sheet glue.

The length of sills for models H, D, M and G, is, respectively: 162 1-4 inches, 147 1-4 inches, 129 inches and 119 inches.

The rear ends of the sills are thicker vertically than are the front ends, although the difference is but a slight fraction of an inch. The thicknesses at the rear end for models H, D, M and G are respectively: 4 inches, 4 3-16 inches, 3 31-32 inches and 3 3-4 inches.

For these same models the measurements at the center of the sill, which point is thickest vertically, are 7 inches, 6 1-2 inches, 6 1-2 inches and 5 3-4 inches.

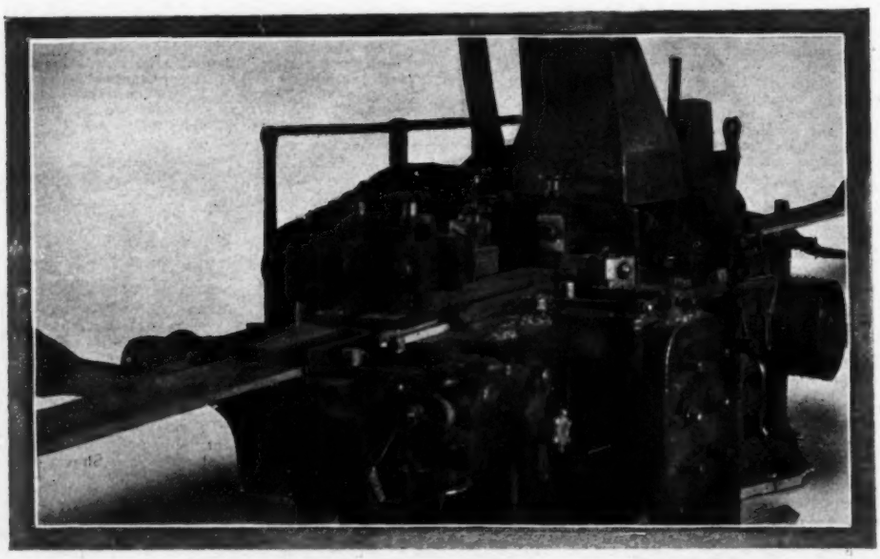


Fig. 1—Showing the process of planing the sill-shaped pieces after kiln-drying

The reason put forward for using a wood sill or frame on the Franklin cars is because it is stronger and lighter and also because its capacity for absorbing vibrations and road shocks is very much greater than that of steel. There are quite a few comparative uses for wood that are somewhat similar under certain conditions and which should be stated in arguing for the advantages of a wood sill. For instance, one of the greatest articles used in impact is the hammer, and all of these have wooden handles. If one were to put a steel handle in one of these hammers a great difference would be noticed in the effect on the human body of a blow.

Another very apt illustration is a steam hammer. Whereas a steam hammer of itself is set on a concrete foundation the anvils of practically all steam hammers used in steel mills and such places are set up on wooden foundations.

Fig. 2—Clamping the three laminations together after they have been glued

In support of the contention that this laminated-ash frame is lighter and stronger than steel a number of tests were made in the Franklin factory. Pieces of ash 4 inches wide and 2 inches thick were obtained. They were as follows: solid piece, 2,370; thoroughly seasoned, laminated piece, 2,500; laminated piece, sap wood material, 1,950. It is thus seen that the thoroughly seasoned, well glued piece of ash wood was the strongest of the three sorts tested.

At the same time tests were made of channel steel of the same comparative size as would be used in making a chassis frame of the size for which the wood pieces are used. Low carbon and chrome nickel steel were used. In no case did the unit weight load get above 1,550 pounds whereas it went as low as 625. The piece which gave the 1,550 pounds unit weight load weighed 12.25 pounds, and was 4 1-2 inches high, 1 13-16 inches wide and was 2-10 of an inch thick, while the strongest piece of ash weighed but 6.25 pounds

The steel tested was what would probably be used in making a chassis frame and on this comparison, which was actually the best, the engineers were able to show that the laminated wood sill was about 65 per cent. stronger and weighed 50 per cent. less.

Calendar of Coming Events

Handy List of Future Competitive Fixtures

Race Meets, Runs, Hill-Climbs, Etc.

July 20-28.....Minneapolis Reliability Run, Minnesota State Automobile Association.
July 29.....Cincinnati, O., Hill Climb, Cincinnati Automobile Dealers' Assn.
July 29.....Philadelphia, Track Races, Point Breeze, Quaker City Motor Club.
July 29.....Richmond, Va., Reliability Run, Richmond *Virginian*.
Aug. 3-5.....Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 7.....Chicago, Ill., Commercial Reliability Run, Chicago *Evening American*.
Aug. 8.....St. Louis, Mo., Reliability Run, St. Louis Automobile Mfrs' & Dealers' Assn.
Aug. 12-18.....New Orleans-to-Memphis Good Roads Tour, New Orleans *Picayune*.
Aug. 12.....Philadelphia, Reliability Run, Quaker City Motor Club.
Aug. 12.....Worcester, Mass., Hill Climb, Worcester Automobile Club.
Aug. 17.....St. Louis, Mo., Reliability Run, Missouri Automobile Assn.
Aug. 25-26.....Elgin, Ill., Stock Chassis Road Race, Chicago Motor Club.
Aug. .....Cheyenne, Wyo., Track Races, Cheyenne Motor Club.
Sept. 1.....Oklahoma, Reliability Run, *Daily Oklahoman*.
Sept. 2-4.....Brighton Beach, N. Y., Track Races.
Sept. 4.....Denver, Col., Track Races, Denver Motor Club.
Sept. 7-8.....Philadelphia, Track Races, Philadelphia Auto Trade Association.
Sept. 7-9.....Hamline, Minn., Track Races, Minnesota State Automobile Association.
Sept. 7-10.....Buffalo, N. Y., Reliability Run, Automobile Club of Buffalo.
Sept. 12-13.....Grand Rapids, Mich., Track Races, Michigan State Auto Association.
Sept. 15.....Knoxville, Tenn., Track Races, Appalachian Exposition.
Sept. 16.....Syracuse, N. Y., Track Races, Automobile Club and Dealers.
Sept. 18-20.....Chicago, Ill., Commercial Reliability Run, Chicago Motor Club.
Sept. .....Brighton Beach, N. Y., Twenty-four-Hour Race.
Sept. .....Denver, Col., Track Races, Denver Motor Club.
Sept. .....Detroit, Mich., Reliability Run, Wolverine Automobile Club.
Sept. .....Steubenville, O., Hill Climb, Automobile Club of Jefferson Co.
Oct. 3-7.....Danbury, Conn., Track Races, Danbury Agricultural Society.
Oct. 7.....Philadelphia, Fairmount Park Road Races, Quaker City Motor Club.
Oct. 9-13.....Chicago, Ill., Thousand-Mile Reliability Run, Chicago Motor Club.
Oct. 13-14.....Atlanta, Ga., Track Races.
Oct. 16-18.....Harrisburg, Pa., Reliability Run, Motor Club of Harrisburg.
Nov. 1.....Waco, Tex., Track Races, Waco Auto Club.
Nov. 2-4.....Philadelphia, Reliability Run, Quaker City Motor Club.
Nov. 4-6.....Los Angeles-Phoenix Road Race, Maricopa Auto Club.
Nov. 9.....Phoenix, Ariz., Track Races, Maricopa Automobile Club.
Nov. 9, 11, 12.....San Antonio, Tex., Track Races, San Antonio Auto Club.
Nov. 27.....Savannah, Ga.—Vanderbilt Cup Race, Savannah Automobile Club.
Nov. 30.....Los Angeles, Cal., Track Races, Motordrome.
Nov. 30.....Savannah, Ga., Grand Prize Race, Savannah Automobile Club.
Nov. .....Columbia, S. C., Track Races, Automobile Club of Columbia.
Dec. 25-26.....Los Angeles, Cal., Track Races, Motordrome.
Date indef.....Port Jefferson, L. I., Hill Climb, Port Jefferson Automobile Club.
Date indef.....Riverhead, L. I., Road Race, Port Jefferson Automobile Club.

Foreign Fixtures

Aug. 6.....Mont Ventoux, France, Hill Climb.
Sept. 2-11.....Roubaix, France, Agricultural Motor Vehicle Show.
Sept. 9.....Bologna, Italy, Grand Prix of Italy.
Sept. 10-20.....Hungarian Small-Car Trials.
Sept. 16.....Russian Touring Car Competition, St. Petersburg to Sebastopol.
Sept. 17.....Semmering, Austria, Hill-Climb.
Sept. 17.....Start of the Annual Trials Under Auspices of *l'Auto*, France.
Oct. 1.....Gaillon, France, Hill-Climb.
Oct. 12-22.....Berlin, International Automobile Exhibition.

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NOTHING is more convincing of the broad worth of the automobile for transportation purposes than the illustrations that are given in the leading story of THE AUTOMOBILE of this issue. These illustrations show by comparison the roads that are devoted exclusively to automobile service, alongside of the roads that entertain horse-drawn vehicles. The roads that are used exclusively by automobiles are sanitary and smooth in the examples given, whereas the roads that are used by horse-drawn vehicles are anything but sanitary, nor are the surfaces smooth. These examples of roads under the set of conditions named are in the nature of positive proof of the lack of acumen and understanding of the men who deprecate the use of automobiles and the elimination of horse-drawn vehicles. It is no longer possible for health officials to carry conviction among intelligent men unless they put themselves on record in favor of banishing horses from the streets of cities, and any argument on the part of road builders that has for its foundation the idea that automobiles have a more marked bearing upon the upkeep of roads than have horses must fall to the ground of its own weight.

* * *

STATISTICS, as they relate to the maintenance of freight automobiles, lose much of their force, due to lack of discrimination of the compilers thereof, who fail to take into account the advances that have been made in gasoline freight automobile building within a year or two. Freight automobile service has been developed in the City of New York to a greater extent, perhaps, than in any other metropolitan center in this country, and in estimating the relative value of types of freight automobiles, account must be taken of the fact that gasoline freight automobiles were barred from docks and warehouses by the unfair rulings of insurance interests, thus making it extremely difficult for the builders of freight automobiles to show the capabilities of their products. The abrogation of these rules has had the effect of improving these freight automobiles and showing to merchants just how capable they are in every-day work.

* * *

GLANCING at the descriptions of motors other than the poppet-valve type, as they are being described in THE AUTOMOBILE, makes it possible to entertain the idea that the United States Patent Office is being inundated with patent applications along these lines, and we are confronted by the rather poor methods that at present obtain in the Patent Office in handling these matters. It is now the common understanding that the unfortunate inventor who receives Letters Patent of the United States in recognition of a service will have to view such Letters Patent in the light of punishment rather than in the form of protection, according to the theory of patent law. If a man who is the owner of a patent, wishing to protect himself against infringers, calls upon his attorney for the purpose of getting advice reflecting a fair measure of his rights and reasonable expectations in the event of an action, he is likely to be told that there is no possible way by which an attorney can gauge the possibilities, and that the merits of actions-at-law involving the rights of inventors are too obscured to offer any reward from discussion. If it takes the large force of examiners under the Commissioner of Patents, aided by all the patent attorneys in this country, to produce the chaos that obtains in patent matters, it may not be too much to say that the clearing up of this muddle is far beyond the ability of any man to suggest.

* * *

DELIVERING packages in department store service, if the cost per package is to be reduced to the actual minimum, requires that the freight automobiles in this work shall be designed according to the needs as indicated by the best expression of experience. It seems to be true that a freight automobile of considerable capacity carrying a large number of packages, utilizing even ten or twelve runners, is superior to a delivery wagon utilizing the services of a driver and one runner, due to the fact that the boys who serve as runners are swift and tireless, and the large-capacity freight automobile is permitted to traverse a main avenue at a fairly good rate of speed, while the boys who serve as runners take the packages from this freight automobile, delivering them to residences within a radius of 500 feet on both sides of the main avenue, at a saving in the first cost of the freight automobiles used, a considerable saving in wagon maintenance, and with a large reduction in the cost of labor required in the service. Modifications of the main plan must be made, depending upon the locality and attending details, but the fact remains that the trend in this field is in the direction of freight automobiles of considerable tonnage, rather than in the use of light delivery wagons.

Fortune for Motor Fire Engines

New York to Spend $700,000 for Apparatus

By order of the Fire Commissioner a board consisting of four well-known members of the department has been formed to take up the subject of completely motorizing the fire department of New York. The committee, which is now in session, is charged to examine and test all available makes of engines and at present there is a vast sum available for purchases. It is expected that the department will be fully modernized in two years.

VIGOROUSLY advocating the purchase and installation of automobile fire-fighting apparatus, the Fire Commissioner of New York has named a special board from among the technical officers of his department to examine, test and report upon the various types of apparatus available for this purpose. This board consists of Deputy Commissioner Farley, of Brooklyn; John Kenlon, Acting Chief of Department; Chief John P. Howe, and Captain Charles Demarest.

The board is now in session preparing for the details of actual work. So far about a dozen different kinds of fire engines propelled by gasoline motors have been considered, and when the list is complete it is believed that between 40 and 50 different makes will have been tested. Manufacturers have been invited to submit data to this board and a vast mass of material of that sort has been sent in or personally submitted.

The requirements of the department are severe and the tests that have been conducted have been exceedingly searching. It is believed by those in the best position to know that the complete motorization of the department will require about two years. Last spring it was thought that it would take about four years to displace every piece of horse-drawn apparatus.

At present the amount of money available for this purpose is $700,000, and this will be increased when needed for actual expenditures. It was announced at headquarters on Wednesday that the work of the board could hardly be completed before the end of this year, but that much would be accomplished in the meantime looking toward this end.

The experience of the New York fire department with automobile apparatus so far has been satisfactory and at this time it is said that there are over 40 pieces of mechanism now being built for the department or in course of transit from the factories to New York.

Thompson Avenue Grade Scores Again

Another automobile was smashed on the Thompson avenue grade crossing of the Long Island Railroad Monday, snuffing out the life of the driver of the car and severely injuring two women. The Thompson avenue crossing is a nightmare to the automobilist of New York. It is on the main artery of travel toward the interior of Long Island, north of the regular routes through Brooklyn proper.

The busiest section of the railroad is traversed by the road at grade, the crossing being a maze of steel tracks. There are gates on each side of the right of way, and at almost any hour of the day or night automobiles may be found lined up on both sides of the crossing waiting their chances to scurry across between the silently rushing trains.

In the busy hours of the day the automobiles are frequently obliged to wait for a half hour to cross.

The Long Island Railroad has always taken a great interest in automobiling, and it has been active in a legislative way to "regulate" automobile traffic so that it might not prove too attractive to possible commuters.

In the case of this accident three cars were crossing when a train bore down upon them while the gates were raised, the way apparently clear and safe.

It is stated that 352 trains pass the crossing every weekday. A contract has just been entered into between the city and the railroad to abolish this and other crossings and the city's portion of the expense is to be $600,000.

Jersey Kills Eight-Day Permits

Perfectly consistent with its action in closing the doors of the State to free touring, New Jersey has now abrogated the eight-day touring license that has served instead of a more generous provision. Commissioner of Motor Vehicles J. B. R. Smith has made the announcement that the eight-day provision is no longer in effect and already a howl has been raised by automobile owners in New York, which has an echo in the hearts or pocketbooks of the hotel owners along the Jersey coast.

In substance the Legislature at its recent session declared that Jersey does not want automobile tourists, despite the piercing cries of disapproval from the hotel men. By its refusal to pass reciprocal legislation the lawmakers place themselves on record as forbidding the free entry of the State to automobiles that have complied with the laws of their home States, unless their owners took out full touring licenses for the year.

The injustice of such action is made apparent when it is realized that there are no such strictures placed upon traffic other than that represented by the automobile. Officials of the A. C. A. have taken up the matter with Commissioner Smith, and the announcement is made that all hope of some mitigation of the order has not been abandoned.

H. A. Bonnell, general manager of the A. B. of T., who is a leading member of Jersey motordom, says he is heartily disgusted with the trend of events and sees little hope for amelioration of conditions in the immediate future.

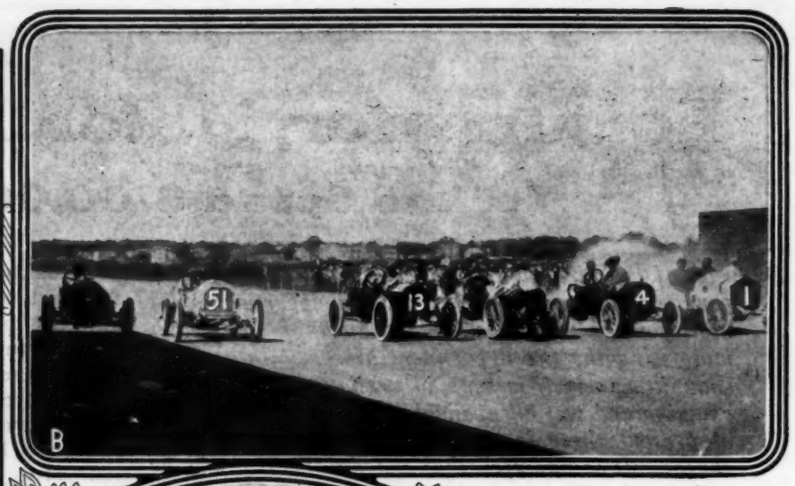
Rules for N.A.A.M. Show

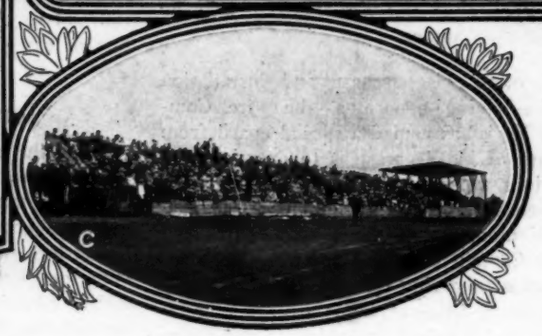
Rules to govern the Twelfth Annual National Automobile Exhibition, which will be held at the Grand Central Palace, New York, January 10-17, 1912, have been issued. These provide that exhibitors at unsanctioned shows shall be barred. The main and second floors of the building will be used for pleasure car displays and the wall spaces for the commercials. Accessories will be displayed on the third floor. Price of space is $1.25 a square foot. One-half of the net proceeds will be rebated to exhibitors. General admission will be 50 cents.

Blue Book Crew Finds Good Roads

BANGOR, ME., July 24—The Blue Book automobile now touring in upper New England had a busy time last week. The car was driven from New York to New Haven, to Hartford, Springfield, Pittsfield, Greenfield, Brattleboro, Keene, Nashua, Portsmouth, Boston, Concord and the White Mountains.

Good roads were encountered everywhere except between Greenwich and Norwalk and Nashua and Concord and a few short stretches in various places.





A—National, winner of third race, rounding the lower turn.

B—Line-up of starters in ten-mile race — National, Marmon, Mercer, Pullman, Jackson, E-M-F

C—General view of the grand stand and bleachers

Ten-Mile Track Mark Lowered

Guttenberg Crowd Sees New Record Made

A big half-holiday crowd attended the Guttenberg race meeting on Saturday and saw a Simplex car set a new mark for the ten-mile distance, and then in the next race witnessed the same car knock a dozen seconds from its own speed record. The races were rather tame from the contest point of view and in only one of the six events run off was there anything that looked like a struggle. This came in the 451 cubic inches class and the winner, a National, after being left at the post and pocketed for several miles, worked its way through to win rather easily.

THERE were no thrills about the racing at Guttenberg last Saturday, the program failing to develop anything spectacular. But on the other hand there was nothing that savored of mishap during the afternoon's sport and the big crowd saw the ten-mile record of the track lowered in two successive races. A 50-horsepower Simplex was the medium and after setting the new mark for the distance at 10.43 3-5 in its class race, it knocked off over 12 seconds from that time in the Free-For-All, placing the new track mark at 10.31 1-5, which will not be disturbed for some time in all probability.

There were five events carded and a match race was added and the number that created the most interest in the running was third on the program.

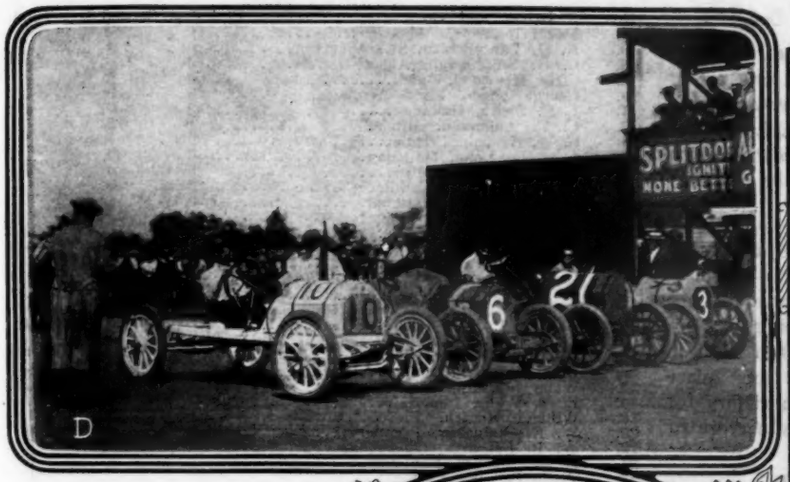
In this race four cars were entered and two added at the post. National No. 1 proved to be the winner after being practically left at the post. The Marmon entry jumped away at the start and opened up a comfortable gap in the first three miles, followed by the E-M-F and Mercer. The latter was going well at five miles but seemed to develop some trouble with its carbureter in the latter stages and could not get up enough speed to stay with the leaders. The National started last and was in a deep pocket for several miles, but along toward the eighth mile it began to loom up like a winner and gradually worked through to the front, not being pushed at the end. The Marmon apparently had the race won at one stage but faltered in the last mile, lasting long enough to get the place from the Mercer, which acted stiff and did not respond to De Palma's urging. This car was not properly tuned up before the races.

The first race was a small class event and was won all the way by the E-M-F entry, the Paige-Detroit being in closest attendance at the finish. The second race was also taken by the E-M-F, which beat the gun and made the pace from end to end. The Pullman was second all the way.

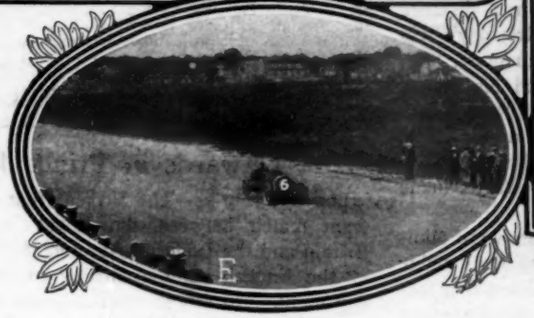
The match race was a procession with the Staver leading the way.

In the big class event the National beat the gun rather flagrantly but was soon overhauled by the Simplex and the rest of the race was uninteresting save for the fact that a new mark for the distance on this track was established only to be overthrown in the next race by the same car. The National was second, Marmon third, and the Jackson blew a tire and did not finish.

In the Free-For-All there was nothing to it but the Simplex which got away with the leaders and outfooted the field. As in the preceding event the National was second and the Marmon



D—Line-up for the five-mile "under 231" race—E-M-F, Overland, Lancia, Paige-Detroit



E—There was a goodly turnout of cars and railbirds

F—Staver winning the five-mile match race

third. The Pullman and Staver contestants did not figure in the running. Limberg was sharply cautioned by Referee Camacho for beating the gun but was not set down.

The track looked as if it needed oil and it certainly was helped materially by the rain of the night before. The club house and the far turns were in bad shape after the first three races had been run and T. B. Shoemaker of the Contest Board made an inspection. He cautioned the drivers to observe special caution in rounding them. A. F. Camacho handled the flags and acted as referee and gave satisfaction. It is estimated that there were between 3,000 and 4,000 present. The summary:

Five Miles Class E Under 231 Inches

No.	Car.	Driver.	Position.	Time
3	E-M-F.	Tower	1	5:47⅘
10	Paige-Detroit	Craig	2	
6	Lancia	Ferguson	3	
21	Overland	Gastieges	No finish.	

Five Miles Class E Under 301 Inches

3	E-M-F.	Tower	1	5:38⅘
13	Pullman	Burke	2	
10	Paige-Detroit	Craig	3	
8	Correja	Gillam	4	
23	Staver-Chicago	Du Closne	5	
6	Lancia	Ferguson	6	
7	Mercer	De Palma	No finish.	

Five Miles Match

23	Staver-Chicago	Du Closne	1	6:40⅘
50	Correja	Gillam	2	

Ten Miles Class E Under 451 Inches

1	National	Limberg	1	11:13⅕
4	Marmon	Rouse	2	
7	Mercer	De Palma	3	
13	Pullman	Burke	4	
51	Jackson	Cobe	No finish.	
3	E-M-F.	Menges	No finish.	

Ten Miles Class E Under 601 Inches

2	Simplex	De Palma	1	10:31⅕
1	National	Limberg	2	
4	Marmon	Rouse	3	
51	Jackson	Cobe	No finish.	

Ten Miles Free-for-All

2	Simplex	De Palma	1	10:43⅘
1	National	Limberg	2	
4	Marmon	Rouse	3	
13	Pullman	Burke	4	
23	Staver-Chicago	Du Closne	5	

Quakers to See Speed Contests

PHILADELPHIA, July 24—Nine events are listed on the program for the fifth annual midsummer track meeting of the Quaker City Motor Club on the one-mile circular race course of the Philadelphia Driving Club at Point Breeze Saturday next, the entry blanks for which were issued this week. The series of races comprises four non-stock cars, divisions 2C, 3C, 4C and 5C, each 10 miles, for a money prize; one-mile exhibition for track record; class D, free-for-all, 5 miles, flying start, for the Remy Grand Brassard and Trophy; a 10-mile open handicap; match race between Burman and Knipper, and a 25-mile combination race.

The meet promises to be second only to the Fairmount Park road race in point of interest, for the country's speediest and most daring drivers will compete for the rich stakes which will be hung up.

Picking Out Virginia Road

CULPEPER, VA., July 25—With the good wishes of Vice-President Sherman ringing in their ears three cars containing a number of good roads boosters left Washington yesterday en route to Richmond.

F. H. Elliott, secretary of the Touring Club of America, and Henry McNair, of the Blue Book, are in charge of the party, which consists of government and State road officials. The object of the trip is to pick out a good road south from Washington to Richmond over which a large number in Richmond in October will travel. That Virginia is alive to the good roads movement was manifested to the tourists in no uncertain manner. Enthusiastic greetings were extended them all along the line and the trip is bound to give the movement a big impetus.

Scenically Virginia is ideal, but its roads leave much to be desired. With a good system of roads it would prove a great touring ground. The present trip will do much to advance the cause. Vice-President Sherman gave the signal which started the tour and expressed his great interest in the work of the touring club.

Amateurs Defeat Trade

In two-day reliability run of the Chicago Motor Club, the amateur team won the honors on the road and a new set of champions resulted from the field games that were enjoyed during the outing. The run was to St. Joe, Mich., and return, 222 miles. On the first day's run the amateur team drew only a single demerit, which was caused by a stalled motor.

CHICAGO, July 24—Undoubtedly the most enjoyable affair ever promoted by the Chicago Motor Club was the team reliability match between the amateur and trade members of the club, with which was combined a field day at the night stop, in which contestants had a chance to demonstrate their skill in athletics other than motoring. The team match took place Thursday and Friday of last week and resulted in a victory for the amateur team, which defeated its trade rival by a score of 221 to 287.868.

The match was to St. Joseph, Mich., and return, a distance of 105 miles going and 117 miles returning. The first day's trip was remarkable for the showing made by the amateurs, who only had one down—Charley Anderson, who killed his motor. On the other team, Charley Van Sicklen, William Roesch, W. D. Foreman and Harry Cooper were penalized for motor stops, Webb Jay found water in his gasoline, Tracy Holmes broke a crankshaft and burned out a bearing, while Harry Watts made a steering gear adjustment.

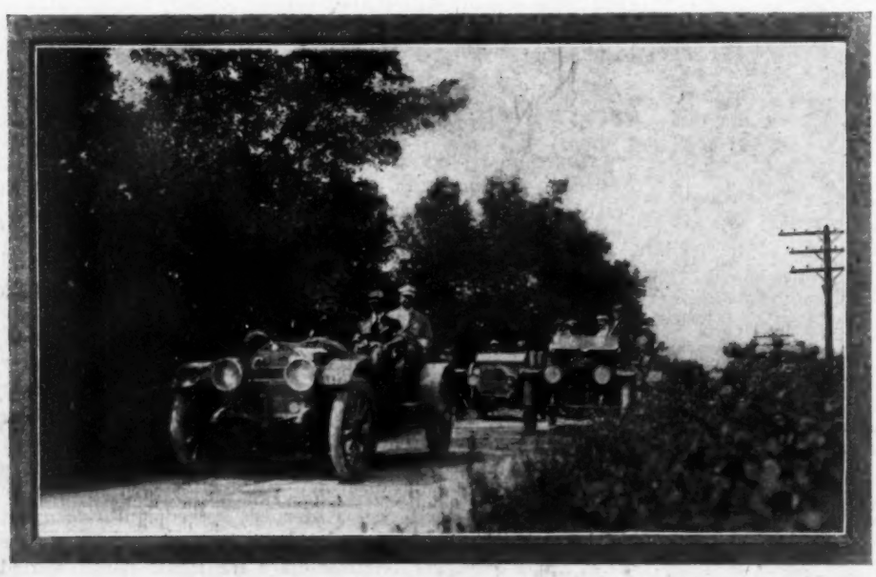
Coming home the second day more perfect scores were eliminated. On the amateur team Sinsabaugh had ignition trouble and never got away from St. Joe; N. H. Van Sicklen, Sr., was penalized when a chain jumped the sprocket, Claude Anderson was demerited heavily for work done, while Gaidzik and Laramie had motor stops. Charley Van Sicklen, of the trade team, changed a spark plug, Gregory had a motor stop, Watts did work and was arrested for scorching.

The trade team had sixteen drivers and the amateurs fourteen, therefore the dealers only were penalized 14-16 of a point instead of a full point. This drew the finish fine, because for a time it looked as if Claude Anderson would not finish. The rules penalized for work done and for being late at controls.

The field day sports were enjoyed by everyone. The baseball game was good, but the other events were more interesting. Swimming, golf, running, jumping, pool and bowling kept everyone interested and resulted in a new set of champions. The standing of the team match is found in the accompanying table:

No.	Driver and car.	First day.	Second day.	Total.
	AMATEUR TEAM			
1.	David Beecroft, Abbott-Detroit	0	0	0
3.	N. H. Van Sicklen, Sr., Apperson	0	1	1
5.	C. G. Sinsabaugh, Abbott-Detroit	0	150	150
7.	C. G. Heywood, Buick	0	0	0
9.	George Knab, Pierce-Arrow	0	0	0
11.	J. H. Smith, Halladay	0	0	0
13.	C. K. Anderson, Mitchell	1	0	1
15.	G. W. Gaidzik, Premier	0	1	1
17.	J. G. De Long, Halladay	0	0	0
19.	F. W. Jencks, Welch	0	0	1
21.	A. C. Berthold, Cadillac	0	0	1
25.	T. F. Laramie, National	0	1	1
27.	Claude Anderson, Empire	0	67	67
33.	J. C. Knisely, Marmon	0	0	0
	Total	1	220	221
	TRADE TEAM			
2.	C. F. Van Sicklen, Ford	1	1	2
4.	C. E. Gregory, Chalmers	0	1	1
6.	Thomas J. Hay, Ford	0	0	0
8.	J. P. Frisby, Staver-Chicago	0	0	0
10.	Gaylord Warner, Thomas	0	0	0
12.	H. C. Watts, Alco	2	63	65
14.	Webb Jay, Rambler	105	0	105
16.	E. T. Wells, Imperial	0	0	0
18.	William Roesch, Pierce-Arrow	1	0	1
20.	W. E. Stalnaker, Premier	0	0	0
22.	W. D. Foreman, Oldsmobile	1	1	2
24.	H. W. Cooper, Chalmers	3	0	3
28.	Tracy Holmes, Corbin	150	Withdrew	150
30.	S. Breakstone, Special	0	0	0
34.	A. M. Robbins, Abbott-Detroit	0	0	0
36.	E. J. Malloy, Mora	0	0	0
	Total	263	66	329

Fractional penalization, 287.868.



Some of the contestants in the Team Reliability Match between Trade and Amateur Members of the Chicago Motor Club

Awards in Prince Henry Tour

LONDON, July 24—The Prince Henry trophy, chief prize in the team match between the Royal Automobile Club of Great Britain and the Imperial Automobile Club of Germany, was won by the English team according to announcement made Thursday night. No scores were announced.

His Majesty the King's cup, a commemorative prize, went to the German club, while His Imperial Majesty the Emperor's cup was awarded to the Imperial club. Her Majesty the Queen's cup for the best appointed car on the German team was given to Landrat von Marx with an Opel, while the corresponding trophy given by the German Empress to the best appointed car on the English team was presented to N. C. Neill with a Rolls-Royce. Princess Henry of Prussia gave a cup for the next best appointed car on either team, which was awarded to F. C. Bowring, who drove a Daimler.

Clean Scores in Cleveland Run

CLEVELAND, OHIO, July 24—The awards in the Cleveland *News* reliability run, made here Saturday morning, show that fourteen cars out of thirty-seven went through the test with perfect scores.

A small number of cars in the run came through without tire trouble of any sort. The large majority of the observers' cards, however, showed that the drivers in the run had tire delays.

The success of the run was in large measure due to the enthusiasm and earnestness of the officials. They were St. Claire Couzzens, of the *News*, referee; Fred Caley, secretary of the Cleveland Automobile Club, checker; Peter Mayer, starter; E. E. Grimes, A. A. A. representative, and Harry Smith, chief observer.

Fiat Wins French Grand Prix

PARIS, July 24.—Hemery in the Savannah Grand Prix Fiat was the only survivor in the French Grand Prix run over the Sarthe circuit, a distance of 402 miles, covering the distance in 7:06:30, an average of 56.54 miles per hour.

When the race was called off the little Bugatti 8-horsepower driven by Freiderich was in second place, having completed ten of the twelve circuits, or 334 miles, in 7:16:50. Gabriel in a Rolland-Pilain did nine rounds in 8:04:38 and Leduc in a Cote, eight laps in 6:19:33.

Maurice Fournier and his mechanic were killed in the seventh round, caused by the front axle breaking and the car going into the ditch. Fourteen cars started.

Eleven Entries for Glidden

So far eleven entries have been made for the tentative Glidden tour of 1911, leaving a minimum of nineteen more entries to be received prior to the time set for closing the lists on August 1.

Announcement has been made that unless at least thirty cars are entered there will be no tour this year. Strong hope is expressed that the list will fill satisfactorily and that the run from Washington to Ottawa, 1,089 miles, will be held some time in September. It is pointed out by those interested that a test of current or advance models in the fall must act as a live selling impulse to the trade, it being a notorious fact that Fall selling is about four times as difficult as Spring selling.

The list of entries so far is as follows:

1911 Cunningham model "H" (pacemaker).
1911 Oakland model "M."
1911 Ohio model "40."
1911 Abbott-Detroit model "B-11" (three cars).
1911 Washington model "D-40."
1911 McIntyre model "M-6."
1912 Maxwell (three cars).

Buffalo Club Plans Big Run

BUFFALO, July 24.—The second annual reliability tour for the Laurens Enos and other trophies, to be held under the auspices of the Automobile Club of Buffalo, will be run September 6-9 over a course of 800 miles, thoroughly covering Western New York, from Lake Erie to Lake Ontario. Entries for the event close on August 15.

Queen Cityans Will Climb

CINCINNATI, July 24.—The committee in charge of the Stanley Hill climb for Saturday, July 29, are assured of a successful event as to arrangements and entries.

Fully a dozen different makes of cars have already been entered. The contest is under the auspices of the Cincinnati Automobile Dealers' Association, and has sanction number 371 of the Contest Board.

Stanley Avenue hill is 2,340 feet in length. On one side of the course there is ample room for 20,000 spectators commanding an unobstructed view of the entire race. Both sides of the course will be protected from end to end with wire rope, in addition to which Chief Jackson has engaged to furnish 200 or more policemen to assure a clear course.

The program embraces eight events of which interest seems to center in Nos. six and eight, the former being for automobile club members only, and the latter a free-for-all.

Premierites Nearing Pacific

RAWLINS, WYO., July 24—The transcontinental tour of the Premier flotilla of ten cars is over two-thirds of the way across the country.

War Automobiles Arrive

Six cars manned by cadets and equipped with balloon fighting guns and wireless reached New York Tuesday, after a tour from Chicago to Washington. Maneuvers were held near the National capital on a broad scale. Major Davidson of the regular army is in command.

SIX war automobiles manned by students of Northwestern Military Academy, Highland Park, Ill., and equipped with rapid fire guns capable of elevation to any angle for balloon destruction, arrived in New York Tuesday on their return trip from the field of special maneuvers at Washington.

Major Davidson of the army is in command of the party and under his direction the students have been making a special study of combatting balloons and other air craft in a military sense.

All the cars are fitted with guns capable of being handled by one man and two of them have complete wireless equipment as well as several balloon envelopes. The expedition will return to Highland Park by easy touring stages.

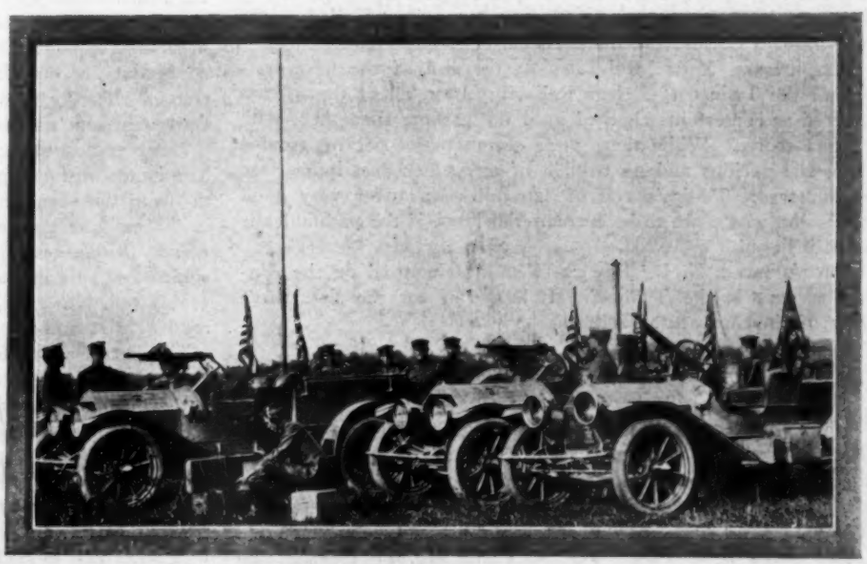
Armleder Enters Automobile Field

CINCINNATI, July 24.—An event of considerable importance to Cincinnati and to the automobile interests is the entrance of The Otto Armleder Company to the ranks of manufacturers in the automobile industry. This decision is the result of about two years of exhaustive experiments, especially in the line of a delivery vehicle of capacity for about one thousand pounds to meet the demands of medium and light transportation such as laundries, dry goods, millinery, &c.

The vehicle will be called the "Armleder". J. Biederman, who has for many years been in the manufacturing plant of the Armleder Company, is the designer of the new machine.

Havers Plant to Be Enlarged

PORT HURON, Mich., July 24—It has been stated that orders for approximately 280 cars, or nearly $500,000 of gross business, have been placed with the Havers Motor Car Company in the past few days and plans are now being formulated to immediately increase the capital of the company and the capacity of the plant. Several offers of large amounts of outside capital have been made, but have been rejected, as the present stockholders prefer to keep the enterprise a strictly Port Huron industry.



Businesslike balloon-fighting equipment of the students of the Northwestern Military Academy, Lake Forest, Ill.

Minnesota-Helena Tour Now On

Third Day Kills Many Perfect Scores

With nineteen automobiles in the contesting column, the third annual reliability contest of the Minnesota State Automobile Association started from Minneapolis last week on its way to Helena, Mont. The tour is accompanied by a hotel train on the Great Northern Railroad which affords accommodations for the tourists en route.

MINNEAPOLIS, July 19.—Under favorable auspices the Third Annual Reliability Run of the Minnesota State Automobile Association started from this city for Helena, Mont., this morning. There were nineteen contesting starters, but from this number must be deducted the Kisselkar pair, the Pierce-Arrow 7 and Packard 19 which will compete only in an unregistered or non-stock car class, owing to the fact that stock car certificates for them have not yet been issued.

The tour has been routed so that it parallels the Great Northern Railroad and a special hotel train accompanies the tourists. The train provides accommodations for 150 people and will stop at all the noon and night controls to serve meals and provide sleeping quarters.

The list of starters included the following:

Car No.	Make	Driver
1	Maxwell	O. W. Klose
2	Marmon	John Fawkes
3	Amplex	P. Kenneth Wiseman
4	Halladay	O. A. Palmlund
5	Kisselkar	C. L. Bonwell
6	Kisselkar	Chris Rice
7	Pierce-Arrow	Julius Suckow
8	Hupmobile	E. B. Stimson
9	Abbott-Detroit	A. N. Smith
10	Stoddard-Dayton	J. H. Prior
11	Colby	M. G. Armstrong
12	Flanders	B. M. Scott
13	Flanders	F. A. Witte
14	Flanders	George Herron
15	Krit	J. E. Dougherty
16	Petrel	A. L. McNurlen
17	Cole	B. Terrell Hoyt
18	Cole	C. L. Rose
19	Packard	W. Stork

The referee is E. P. Dutton and pilot, C. S. Harrington, who laid out the route last spring following the line of march of the Lewis and Clark expedition. The pilot car is a Halladay, the pacemaker a Corbin, and the press car a Pierce-Arrow.

ALEXANDRIA, MINN., July 20.—At the end of the first day's run of the Twin City-Helena Reliability tour, all of the 19 cars entered as contestants checked in at the parking space here with perfect scores. While there were several cases of tire trouble none was serious and no trouble of any other description was encountered. To-day's run of 140 miles was over very good roads, but worse are to be encountered later, if the pathfinder is to be believed.

DEVIL'S LAKE, N. D., July 22—Penalties imposed on the contesting cars in the Twin City-Helena run for the first three days of the tour are as follows:

No.	Car.	Penalty.	Cause.
15	Krit	6	Replacement of broken steering arm.
16	Petrel	3	Taking on water.

With only two cars penalized during the first three days of the reliability run from the Twin Cities to Helena, Mont., all checked in here to-night on time. None of the contesting cars has had any accidents other than those for which penalties were imposed.

The roads from Fargo were excellent and the tourists ran ahead of schedule. Almost all the way was over smooth, hard gumbo, which makes the finest kind of road when dry as it was this morning.

Soon after leaving Grand Forks it commenced to rain, which lasted all the afternoon, and the motorists were afforded a sample of wet gumbo. Tire chains became a necessity and even then the cars skidded badly at times.

The town of Devil's Lake was reached about seven in the evening. The tourists rest up here over Sunday and will check out for the next run of 167 miles to Berthold Monday morning.

BERTHOLD, N. D., July 24—Penalties for first four days of Twin City-Helena tour:

No. 15, Krit, second day, 12 points; third day, 38 points; total, 50 points.

No. 16, Petrel, third day, 3 points; fourth day, 12 points; total, 15 points.

No. 11, Colby, second day, 2 points.

No. 18, Cole, fourth day, 461 points.

No. 1, Maxwell, fourth day, 121 points.

No. 4, Halladay, fourth day, 36 points.

No. 3, Amplex, fourth day, 6 points.

The first car to suffer penalization was the Krit, which was assessed for the replacement of a steering arm. On the next day the replacement of two steering knuckles caused the assessment of the 38 points in addition. The 3 points against the Petrel were imposed for taking on water out of control, while the Colby was penalized for hooking up a loose wire on the accelerator.

To-day's run from Devil's Lake to the night control here is the hardest of the trip. In spite of this a schedule of 20 miles an hour was maintained and all but one of the contestants checked in before their time limit had expired.

The Stoddard-Dayton and the Cole 30 were the only cars to fall behind the schedule. A broken rear axle, sustained when the former made a wrong turn and the car ran into a coulee, laid it up for about two hours while repairs were being made by a neighboring blacksmith. None of the occupants was injured, but the driver and entrant, J. S. Prior, withdrew the entry from the run, intending to have repairs made and continue as a non-contestant. Upon his arrival at the night control with the car in running condition, Referee Dutton was petitioned by the other contestants in his class to allow Prior to continue as a contestant. The referee then permitted the car to check in as a contestant and assessed the penalties provided.

Many perfect scores were spoiled to-day by the rough roads. The motor on the Amplex, No. 3, stopped twice by the failure of the hand fuel pump to work. The Halladay, No. 4, sprung a leak in the gasoline tank and lost all its fuel, requiring two stops of 15 and 18 minutes respectively. The gas tank was removed and soldered. This car also lost a tire iron and the tail lamp.

Maxwell, No. 1, broke its fuel pipe after having been on the road only 20 minutes and was detained 12 minutes.

The Petrel added to its score by breaking both front springs. Temporary repairs were made by blocking them up with wood.

J. E. Dougherty, driver of the Cole, No. 18, distinguished himself to-day by making a novel repair of his gear-shifting mechanism in making a quick stop after taking the wrong road on the second day of the run. A lug on the gear shift arm was sheared off, preventing the use of any but high speed; after running a day and a half on the high, during which time it was necessary to both start and take all the hills on the high gear.

Imperial Wins Trophy

An Imperial touring car penalized one point won the sweepstakes prize, the Milwaukee Sentinel Trophy in the Wisconsin State A. A. run last week. A Ford car was first in the roadster division while a Franklin took the honors in the privately owned division. Lewis Strang, racing driver, was killed by a caving bank during the tour.

MILWAUKEE, WIS., July 25—With but a single point charged against its record, a 1911 model 44 Imperial touring car, driven by Harry Bisbee, of Jackson, Mich., won the second annual reliability contest of the Wisconsin State Automobile Association, taking down the Milwaukee *Sentinel* sweepstakes trophy for a year and the Milwaukee *Journal* cup for touring cars, for permanent possession.

The Ford was close behind the Imperial and with its 2-point penalty won the Milwaukee *Evening Wisconsin* trophy for roadsters, to be held permanently.

The car was driven by William H. Diener, and entered by the Hickman, Lawson Diener Company, State agent.

The Emil Schandein trophy for one year's possession by the privately owned car making the best showing was awarded to J. D. Babcock, whose model "D" Franklin incurred a penalty of 17 points under the Grade 3 rules governing this division, and a 61-point penalty under the Grade 1 rules governing the trade classes, in which Mr. Babcock also entered and drove his car. The model R Reo, the only 1912 model in the tour, made an excellent showing, taking second place in the touring car class with only 6 points chalked up against it.

The Imperial's 1 point was incurred in the final technical examination, a bolt on the mudpan being found loose. It was at first thought that there was a radiator leak, but exhaustive tests showed this to be perfect. The car was gone over again, but no fault could be found and the final penalty was 1 point.

The model T Ford was a close contender with the Imperial for first honors. Diener incurred a penalty of 1 point for motor stop on the fifth day's run, and an additional point was imposed in the technical for a leaky water connection.

August A. Jones' No. 1 Cadillac, which made a beautiful run on the road and came through the brake clutch and motor tests clean, being touted as the winner, fell down on the final. Three points were imposed, 1 for a leaky connection and 2 for loose cap screws.

The winning Imperial's team mate, No. 7, stood fourth in the roadster division with 8 points. Herb Crampton lost 6 points in the brake test and 2 in the technical for loose bolts. The Warren Detroit made one of the best performances of any car and Rockstead was the only one to come through the final examination with a perfect score. However, he had been assessed 12 points for putting sand on a slipping clutch on the road and 2 points in the brake test.

The final result and penalizations, regardless of class or division, was as follows:

No.	Name of Car.	Driver.	Penalty.
8.	Imperial	Harry Bisbee	1
6.	Ford	W. H. Diener	2
1.	Cadillac	A. A. Jones-Fuhrmann	3
9.	Krit	W. G. Westwood	4
5.	Reo	A. J. March	6
7.	Imperial	Herb Crampton	8
15.	Warren-Detroit	R. D. Rockstead	14
12.	Overland	R. B. Bates-Heber	22
10.	Case	Will L. Jones	29
2.	Buick	Emil Hokanson	31
11.	National	Charles Merz	33
13.	Franklin	J. D. Babcock	61
3.	Buick	Geo. P. Hewitt	63
4.	Buick	Nicolanzzo-Munson	162
14.	Regal	C. H. Delafield	259
16.	Petrel	Jesse J. Mack	1459

Lewis Strang, driver of the technical committee Case car, was killed Thursday near Richland Center. Strang had driven through a toll-gate and had stopped within 3 feet of an embankment waiting for a rig to pass. The bank gave way and precipitated the Case to the bottom. Strang was caught between the running board and ground and died almost instantly.

Detroit News Notes

New automobile ordinance in Detroit has brought about a reign of terror among motorists. Welch-Detroit factory to move to Saginaw and car will in future be known as the Marquette. These plans also contemplate placing the Rainier car in the same category. Lozier will not race on dirt mile tracks. Other items from the manufacturing center.

DETROIT, July 24—Detroit motorists are just now undergoing a veritable reign of terror, due to the strict enforcement of the new traffic ordinance. The limitation of speed outside the mile circle to 15 miles an hour, the provision making it necessary to keep 6 feet or more from a standing street car and the prohibition against passing street cars to the left form the ground for most of the complaints, and the judges of the recorder's court have been assessing fines at a rate which surpasses anything in local history. Two sessions of the court resulted in the collection of more than $2,000 in fines, while there are almost daily instances of heavy penalties.

The approach of the usual relaxation of activity is noted at the local factories. Aside from those already engaged in the production of the 1912 cars, the local factories are, generally speaking, engaged in clearing the decks for the change to new models and in the taking of inventory and the installation of new machinery. The rush of the busiest part of the season is now over and the period of transition finds but few of the plants running at top speed.

A feature of the retail trade this year has been the notable increase in the business done in used cars. One of the largest, best-located and most elaborately equipped of the new garages in the city—that of the Gillespie Automobile Company—is devoted entirely to the sale and repair of used cars. The showroom occupies one of the finest Woodward avenue corners.

An important announcement of the week comes from the General Motors Company headquarters and concerns the Welch-Detroit plant. This establishment has been ordered to prepare for a transfer to Saginaw, where the Marquette Motor Company's plant will be at last transformed into a real motor-car manufactory. The present name of the car will be abolished and the output of the plant will be known as "Marquettes." It is understood that the present Welch-Detroit plans will be carried out on a larger scale at Saginaw and combined with the plans of the Rainier, manufacture of which will also be under the new name.

The matter of racing on dirt tracks, both of mile and half-mile circumference, will be discussed here at the next meeting of the Manufacturers' Contest Association. There is a strong feeling among the manufacturers that such events are so unsafe as to court disaster, injuries to drivers and loss of life. It is not believed, either, that the cause of automobiling in general derives any benefit from such competition. Many of the manufacturers would be glad to sign an agreement not to race cars on such courses and to do all in their power to discourage their agents and owners of their cars from doing so.

Large Garage Opened in New Jersey

Freehold, N. J., is now in possession of what is claimed to be one of the largest garages of the State. It forms part of the building of the Freehold Motor Co., agents for Maxwell and Columbia cars in that territory, who conduct the garage business in addition to a salesroom where accessories and tires are handled. The new building of the company is about 60 by 180 feet, the salesroom being 40 by 48 feet in area, and the garage having a capacity of more than 60 automobiles, 60 by 124 feet. In addition to this there is a machine and repair shop located in the rear of the building, equipped with the necessary tools and containing the air compressor and the power plant of the building. The building is constructed of hollow pile and concrete, thus being fireproof.

New Things Among the Accessories

Rust-Proof Demountable Rim

THE new rim illustrated herewith, and named after Detroit, where it is made, is distinguished by its locking feature which is seen in Fig. 1, showing a small portion of the rim. The lock L1 consists of a flat piece of metal with two segments cut out near its two ends for the ground joints J1 and J2 to fit in. In the center of the locking plate is punched a circular hole fitted around a strong metal ring which is securely fastened into the section of the rim S1, permitting the tire valve stem to come out through the ring. Turning the ring in a clockwise direction unlocks the plate from its relation to the ground joints and permits of lifting the section S1 from the rim without any effort; while, on the other hand, with the locking plate in position the section makes a waterproof fit against the rest of the rim. Furthermore, the lock is automatically held in place when on the wheel, because the construction of the lock assures a close all-along contact with the felloe band.

The second important characteristic is shown in Fig. 6, illustrating the special rust-breaking tool of the Detroit demountable rim. The necessity of a tool to avoid the formation of rust and to permit its eventual breaking off of the tire has long been recognized, and the makers of the Detroit rim claim to have solved this problem. The tool T1 consists of a bolt and two members, of which M1 is movable on the thread and rigidly connected to the shaft C1, while M2 is forged integral with a guiding ring G1 which permits the shaft to rotate in it. The use of the rust-breaking tool is as follows:

If rust formation between tire and rim is suspected or too close adherence between them is to be avoided, the bolt is so turned by means of the handle that M1 is drawn toward M2, thereby contracting the rim, which diminishes its circumference while that of the tire remains unchanged. Consequently, the tire is broken loose from the rim, and for some time insured against rust formation. After the rim has been contracted, removing and replacing a tire is very easy.

In Fig. 6 are also seen the draw bolt B1 and wedge W1 which serve to fasten the rim to the wheel. The simple and substantial construction is clearly indicated by the illustration, and mention is to be made of the fact that a draw flange is used back of the wedge without cutting or weakening in any way any part of the draw bolt, which is half an inch thick at its weakest point. The wider portion of the wedge opening permits the bolt to pass through it easily, and when placed in the wheel the bolt moves up automatically, making a unit with the wedge, which now has to come with the bolt if the latter is removed. Countersunk on the inside of the wheel hard brass nuts are provided to receive the bolt and hold it in place, and the use of brass prevents the formation of rust at this portion of the rim. There are six bolts used to hold the rim on to the wheel, and since the wedges cannot stick and rust in on the rim, the latter almost falls off on account of its weight when the bolts are loosened. Rusting of rim to felloe band is prevented by the special tool, and if they stick, expanding the ring will separate them.

With a set of five rims are furnished all the bolt wedges, felloe plates, end nuts, the rust-breaking tool and one wrench, by the Snyder & Harbridge Selling Company, 247 Jefferson avenue, Detroit.

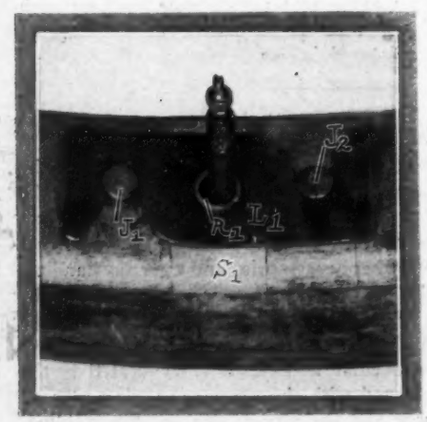


Fig. 1—Showing the tire valve and demountable rim lock closed around it on the Detroit

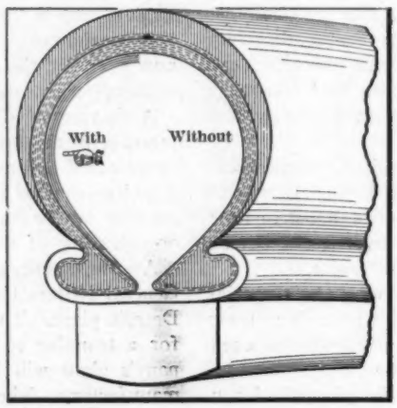


Fig. 2—The Tire Inner-Lining which prevents overheating of tire tubes, and minimizes blowouts

Tire Inner-Lining

BLOW-OUTS may happen while an automobile is running at normal speed, but in the majority of cases they occur when going at a high rate, comparatively, and their relation to the overheating of the tires is a well-established fact. Unfortunately, there is no way of keeping down the temperature of tires in a manner similar to the cooling of cylinders by water-jackets, but the problem of lengthening the life of tires under hard-working conditions resolves itself into an "insulation" being so introduced as to protect the tubes from the heat produced by the friction between tire and road. In the illustration (Fig. 2) is shown the asbestos leather inner lining, which consists of a double layer of asbestos with a stratum of hide interposed and which is placed inside the outer casing, thus shielding the inner tube from the heat. The makers, the Auto Tire Inner-Lining Company, of Cincinnati, Ohio, claim a very material increase of the life of tires where the lining is applied in the manner shown in the illustration.

Hartford Safety Crank

STARTING CRANKS, unskillfully handled, are treacherous; they have caused numberless arms to be fractured, not a few skulls to be broken, equally numerous damage suits to have been brought to court and thousands of dollars to be expended in the abatement of what hitherto has been pretty generally considered a necessary evil. Probabilities are, indeed, that with spark and throttle properly adjusted, and a starting crank pulled up smartly, the operator will get away safely every time he performs this operation; but how many automobilists are there who always keep these simple points in mind? It is a peculiar property of the small objects distributed all over the world that they are extremely malicious.

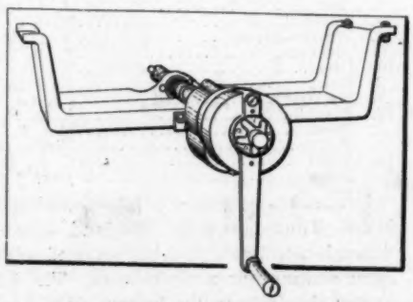


Fig. 3—The Hartford safety crank to overcome the deleterious effects of backfires

and just as pencils, matches, policemen and other desiderata are seldom to be found when needed, a starting crank seems to be awaiting an opportunity to break the arm of an unwary automobilist after having acquired his confidence by apparently tame and harmless behavior.

In such a live industry as that of manufacturing automobiles and their accessories there is no chance of a want being felt and not also being filled soon thereafter. Therefore, as the number of automobiles and with them the number of cranking accidents increased, makers of accessories and various constructors strove to devise some means of starting an engine without the operator being forced to encounter the dangers of the back-kick. Two schemes were adopted by the various makers—the self-starter, and the safety crank.

Describing one of the latest results of endeavor along this latter line, it will be of interest to note that the Hartford Safety Crank, which is made by the Hartford Suspension Company, of Jersey City, N. J., was evolved after three years' continual work. The problem was approached in a manner in which it had not been attacked before, the inventor utilizing the experience of the makers with Truffault-Hartford shock absorbers, in which a friction joint is used to take up a sudden shock caused by road inequalities. In fact, there is a miniature shock absorbing mechanism located between the crank and the gearing which transmits the cranking movement to the crankshaft of the engine.

The safety crank is illustrated in Fig. 3, indicating its strength and showing the nut used to adjust the pressure between the spring plunger pawl rigidly fastened to the crank and the stationary ratchet which is attached to a gear reduction box. If the crank is turned in the usual manner, it turns a friction disc mounted on a shaft which transmits the motion to the gearwheel in the box where it is reduced to a low gear. The friction between the disc attached to the crank and the one mounted on the secondary shaft is sufficient to turn over the engine, but if back-firing should occur and the tendency to back-kick manifest itself a spring plunger mounted in the ratchet housing positively holds ratchet and pawl in contact, thus braking the torque exerted on the crank. The latter is thereby held in place, and owing to the minimum amount of friction between the discs, the secondary disc fails to turn the primary one—the one attached to the crank—around and slips without transmitting the work of the engine to the crank. In this manner back-kicks are avoided.

Fig. 4—Phelps spark plug attachment to detect the cylinders that miss fire.

The combination of the oilless friction discs and the low-gear transmission also results in easy cranking, avoiding all the dangers accompanying the lifting of a heavy weight, which may result in internal injuries even more serious than a broken arm.

Spark Plug Trouble Finder

METHODS of locating a misfiring plug are numerous, and as a rule the most troublesome ways of doing this work are the least efficient. Automobilists who have gone through the embryonic stage of their career will appreciate a device that will help them to find out, in a short time, which of the four or six plugs refuses to work without getting their hands covered with dirt, soot and receiving an electric shock at times.

Among the several appliances now on the market for the purpose mentioned the Phelps trouble finder, shown in Fig. 4, is fastened to the terminal with the looped end, the other end being connected to the

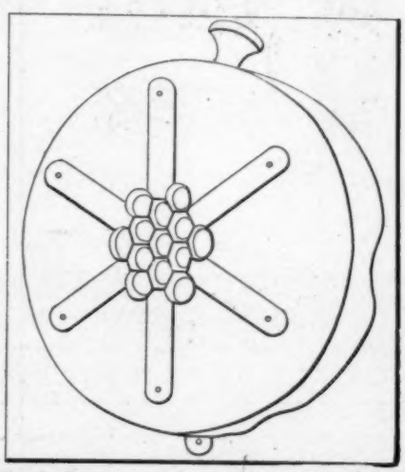


Fig. 5—Receiver on the Auristophone, saving the automobile passenger from excessive vocal strains

source of electricity, and when the plug works properly a spark will appear between the two points inside the trouble finder, while if the cause of misfire lies in the magneto or coil no spark will appear. This accessory is manufactured by the New England Equipment Company, Boston, Mass.

Automobile Auristophone

The appliance so named and shown in Fig. 6 has been constructed with the object of increasing the comfort of the passengers of a closed car, being either of the limousine, laudaulet or taxicab type. It is very unpleasant for a person riding in one of these comfortable machines to risk his safety whenever he wishes to give the chauffeur an order, but such a situation is hardly to be avoided if it is necessary for the passenger to put his head out of the window. Abstracting from the danger of such an undertaking, the point must be borne in mind that the noise of the street makes it impossible for the driver to hear and understand "his master's voice" unless the latter shout in a manner which must necessarily hurt his own gentlemanly feelings.

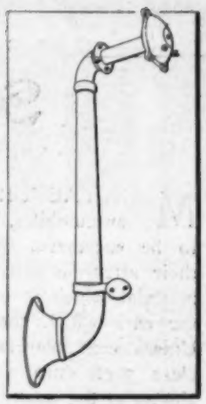


Fig. 6—The Auristophone, an electric sound transmitter

Speaking tubes have been installed to improve the situation and a further step in the forward direction presents itself in the form of the auristophone, which consists of a reproducer to be attached to the outlet of the tubing and one or two receivers installed at the other end of the line. The receiver is shown in Fig. 5. A set of three cells delivering a current at 6 volts is the source of power which helps to intensify the sound waves entering the receiver in the interior. By pressing a button on the receiver the circuit is closed and the receiver put in action, taking up and intensifying the sound waves, and then transmitting them, as electrical oscillations, to the megaphone, the top of which carries the reproducer. The latter translates the electrical waves again into sound waves. The megaphone and reproducer are so placed that the intensified sound strikes the ear of the chauffeur directly, none of the sound being lost in the process, so that the orders of the passengers are clearly heard despite the noise of the street.

While the regular set sold by the manufacturers, the H. G. Pape Electric & Manufacturing Company, of Buffalo, N. Y., comprises one receiver and one reproducer, they also market a set permitting of the installation of another system in which two receivers are used and more sound waves are taken up and transmitted to the driver's ear.

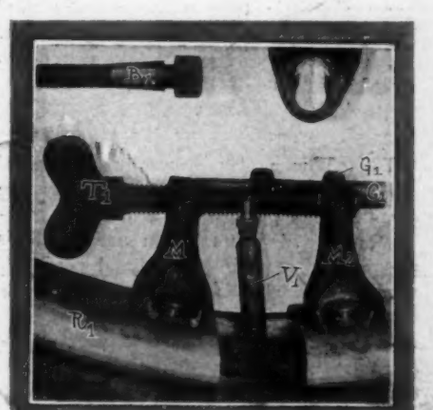


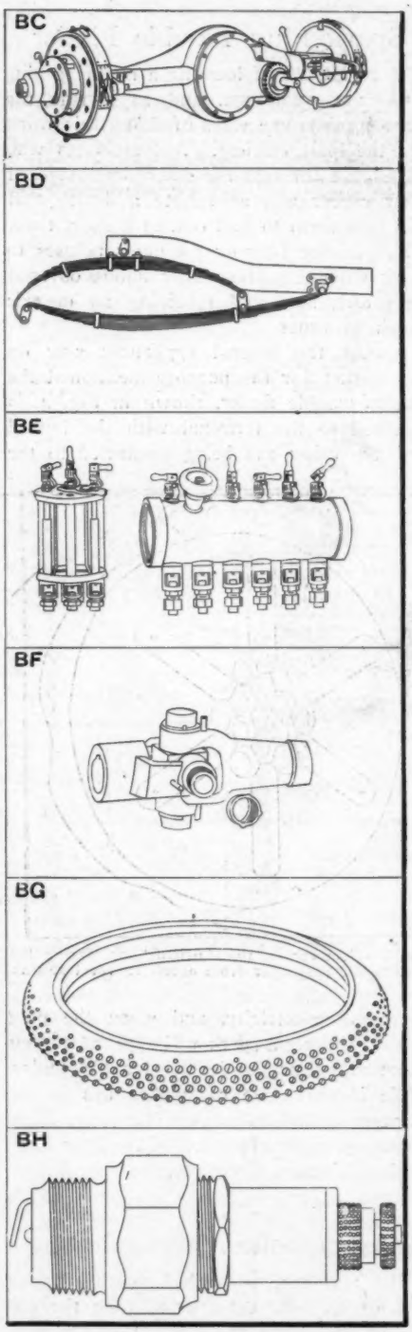
Fig. 7—The special rust-breaking tool, a feature of the Detroit demountable rim

Seen in the Show Window

MANUFACTURERS of assembled automobiles, if they feel determined to be successful in their business, turn their attention toward the quality of the material which is used in the makeup of the cars which their factories turn out. Unless such manufactories assemble high-class parts into a harmonious unit, all aiming at the target of success will remain futile, and time and money of the men directing the undertaking will be wasted. A good motor is the soul of the automobile, taking a good one for consideration, but to imprison it in a poorly made chassis, having low-grade axles and wheels means to throw pearls before the swine. The parts mentioned, to have inherent quality, must be the result of standardized methods of production and the use of up-to-date, reliable machine tools, and our illustration (BC) of the rear axle made by the American Ball Bearing Company, of Cleveland, Ohio, hints at strength and quality incorporated in the product by the manufacturing process.

THERE is no way of avoiding depreciation in a machine, but the endeavor of the engineer is to concentrate it on as few parts thereof as possible, which in almost every case means a saving. While this process necessitates the use of high-grade material for the parts which thus take most of the strain, and this increases the first cost and maintenance of the part proper, the machine as a whole profits thereby and the owner saves in the long run. Automobiles, as they travel over common roads, would be bound to depreciate rapidly, were it not for the springs that are made to take by far most of the shocks and strains created by these conditions. At (BD) is shown the Radial Elliptic Spring, this being of the three-quarter elliptic type now generally used in the rear suspension of an automobile. The Garden City Spring Works, Twentieth street and Santa Fe Railway, Chicago, are the makers.

IT is now pretty generally recognized that efficient oiling of not only the cylinders and pistons, but also of all moving parts and joints of an automobile is an absolute requisite of a good performance. To be able at all times to see at a glance whether the lubricating system is working properly or not is a very desirable state of affairs, since it will relieve the careful automobilist of the continuous suspense caused by the idea that something may be wrong, while even the careless man will receive a timely warning when the oil in the tank is running low, if there is a sight feed installed on the dash of his car. Two types of sight-feed lubricators are shown at (BE), both being made by the Lunkenheimer Company, of Cincinnati, Ohio. They are equipped with check balls and baffle caps, which insures proper working of the devices at all times, since because of the two features mentioned it is impossible for cylinder back-pressure to fill and stop up the sight feeds.



BC—Rear axle made by the American Ball Bearing Co., Cleveland, O.

BD—Showing Garden City Works' radial spring of the three-quarter elliptic type

BE—Two types of Lunkenheimer sight-feed lubricators

BF—Illustrating a strong and simple form of universal joint

BG—Illustrating the Racine Leather-Tread Horse-Shoe Tire

BH—The Indian spark plug, made of Indian pipestone

A CHAIN is no stronger than its weakest link, and considering the fact that an automobile driveshaft serves in a capacity somewhat similar to that of a driving chain, it stands to reason that the universal joint connecting this shaft with the rest of the transmission system must be very strong in order to withstand the strain put upon it by the hard work it has to do. A strong and simple form of universal joint is seen in the illustration (BF) and attention is called to the special type of grease cap, the thread of which has six turns and which is sure to stay in place and keep the part it covers well lubricated. This is the style A of universal joint made by Blood Brothers Machine Company, Kalamazoo, Mich.

RUBBER being an expensive material, numerous attempts are being made to replace it in tires, at least to some extent, and the use of a leather tread on a shoe built of Sea Island cotton layers frictioned with Para rubber is the practice of making automobile tires at the factory of the Racine Auto Tire Company, Racine, Wis. The tire is illustrated at (BG) and shows the anti-skid tread made of chrome-tanned leather, four strata of which are superimposed and united by three layers of pure up-river Para rubber. Rivets driven through the two top layers of the leather insure a non-skid effect, and from this peculiar construction has been derived the name Racine Horse-Shoe Tire.

INSULATING materials used in spark plugs must have a high electrical resistance, and experimenting with several materials has led the makers of the Indian (BH) to the utilization of Indian pipestone specially treated by a chemical process. In addition to this feature, the plug is said to be damaged neither by excessive heat nor cold, nor will it retain soot, and the spark plug is guaranteed to last five years by the Templeton-Barrett Company, whose factory is at Marinette, Wis., while the Gotshall-Bailey Sales Company, of 1254 Michigan Avenue, Chicago, are sole distributors for this product.